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ABSTRACT

British science and mathematics education activities are described. Brief accounts are given of developments in the following Schools Council projects: Integrated Science (grades nine through eleven), Science 5/13 (grades one through eight), Environmental Studies (grades one through eight), and Mathematics for the Majority (grades seven through eleven). Books, films, and instructional kits for science, and an information service provided by a computer firm are also described. The educational implications of conversion to the metric system, the development of the Open University, and reports prepared by the Scottish Consultative Committee on the Curriculum and by Schools Council working parties are discussed. Nineteen books, or series of books, are viewed. These publications include texts for student use, notes on evaluation techniques, and reviews of science and mathematics education in Australia and Africa. Abstracts of selected articles in the British educational press are provided. Summaries of recent developments in British Honduras, Israel, Nigeria, Tanzania, Thailand, and Uganda, and accounts of three international conferences and details of a competition for science and mathematics teachers conclude the news articles. An index for newsletters 13-18 is appended. (AL)

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ACTIVITIES IN BRITAIN - SCIENCE

1. Schools Council Integrated Science Project (See SEN 12:4, 13:4, 14:3)

Diffusion and teacher education in SCISP

1.1 Problems Posed in Diffusion.

In formulating diffusion plans the project needed to answer the question "What differences are there between the teaching of current science courses for 13-16 year old O level pupils and the teaching of SCISP?". There are three main differences:

1.1.1 Teachers are expected to teach outside their own disciplines.

1.1.2 There is content which is unfamiliar to most science teachers (eg social studies, social science, earth science).

1.1.3 New approaches to learning and to assessment are being proposed.

The project has short-term, medium-term, and long-term plans for solving the problems of diffusion and teacher education which are raised as a result of these three differences.

1.2 Short-term plans

Short-term plans are being tested in Phase I and Phase II schools (which started trials in September, 1970 and September, 1971 respectively). The organisers believe it is the job of the project both in its advice given to teachers and in its publishing programme to do everything within its power to aid short-term solutions to teacher education.

Advice to teachers includes a variety of ways of 'team teaching' and the holding of regular departmental meetings. (Case studies are being published.) The publishing programme includes Pupils' Manuals, Teachers' Guides, Technician's Manuals and Background Books, all of which are essentially aids for teachers. (The only necessary publication is the Teacher's Handbook.) As teachers become familiar with the project, the aids can be discarded.

1.3 Medium-term plans

Phase III (from September, 1973) will bring medium-term plans into effect. Every LEA will be asked to propose at least one school which will start teaching SCISP from September, 1973. A necessary requirement for participation will be that the science teachers in these schools should be prepared to assist with in-service training within that Authority, preferably using the teachers' centre. There will be close liaison with the LEA Science Advisers, and already two conferences have been held in which advisers have been told about SCISP and hsve been given trials materials. A further conference will be held in December, 1972. The ASE committee of science advisers has been kept fully informed and has promised its support.

1.4 Long-term plans

Eventually, it is hoped that Colleges of Education and University Departments will train people so that they can teach Integrated Science.

To help in this, a Colleges of Education Working Party is in existence. One of their first tasks is to prepare a STEP curriculum review box.

The GCE examination will also have considerable influence on any long-term changes. This is one reason why assessment is being approached so seriously by SCISP.

2. Schools Council Integrated Science Project - Links to Further Education

2.1 Further Education

Integrated Science is a GCE O level subject for the scientifically more able 13-16 year old pupils which will lead to a double certification. Many pupils at the age of 16 years will wish to continue their formal education in colleges of further education, and so it is important that integrated Science should provide a good foundation for all relevant courses.

All pupils in secondary schools should have a course in science at least to the age of 16„ and their understanding will be the greater and capable of more effective application if it is acquired by a unified study rather than by an increasingly artificial separation into different uncoordinated disciplines.

The many pressures on the curriculum can force pupils sometimes to have to choose one or two from among the three science subjects or between science subjects and other subjects, and so lead to premature specialisation.

2.2 The Project's Brief and Aims

There are four main aspects to the brief:

The content should draw from the major areas of science.

An integrated scheme should be prepared which would lead to GCE double O level certification.

One-fifth of the school time-table should be devoted to the subject.

Integrated Science should provide an adequate foundation for A level studies in chemistry, physics, biology and physical science, and for studies of similar academic requirement.

The present aims of the course for assessment purposes are shown below. It will be seen that not only is SCISP concerned with knowledge and its application but that attitudes and skills are also considered important.

2.2.1 Knowledge

1.A. to recall and to understand that information which would enable pupils to take A level courses in biology, physics, chemistry or physical science, would enable them to follow a job in science and technology, would enable them to read popular scientific reporting and would enable them to pursue science as a hobby.

2.A. To understand the importance of patterns to the scientist and to use these patterns in solving problems (both of a laboratory and of a household type).

3.A. To be able to recognize scientific problems.

4.A. To understand the relationship of science to technical, social and economic development, and to be appreciative of the limitations of science.

2.2.2 Attitudes

1.B. To be faithful in reporting scientific work.

2.B. To be concerned for the application of scientific knowledge within the community.

3.B. To have an interest in science and technology and be willing to pursue this interest.

4.B. To be willing to make some decisions on the balance of probability.

5.B. To be willing to search for patterns, to test for patterns, and to use the patterns in problem solving.

6.B. To be sceptical about suggested patterns.

2.2.3 Skills

1.C. To work independently and to work as part of a group.

2.C. To discover and to use available resources such as books, apparatus and materials.

3.C. To organize and to formulate ideas in order to communicate to others, and as an aid to understanding, critical analysis, etc.

2.3 What Form will the Scheme Take?

The content of the work is based on three useful ideas of science: building blocks (which range from the electron to planets), interactions, and energy. Throughout the three years, there will be the continuous search for 'patterns'. By a pattern the project means an important generalization or explanation. These patterns will be used to solve problems (which may be found both in and out of the laboratory).

Generally speaking, a 'guided discovery' approach has been adopted. A firm foundation of the understanding of concepts will be established before patterns are used to solve problems.

This means that pupils entering further education after studying Integrated Science will have a 'problem solving approach' to science, as well as a knowledge of basic concepts and generalizations. The scheme places an emphasis on the technological applications of science as well as promoting an appreciation of some of the sociological implications.

The main sections in the provisional sample scheme are shown below.

2.3.1 Part 1 Building Blocks

The emphasis in this part is on the nature of the different building blocks, the way in which they are connected, and the gradation in their sizes. The most important theme will be size (and its measurement).

Section 1: Galazies; planets; the earth and life
Section 2: Communities and populations
Section 3: Organisms
Section 4: Cells and the development of organisms
Section 5: Molecules
Section 6: Atoms and giant structures
Section 7: Ions and the electron

Some interactions of building blocks

Section 8: Particle interactions
Section 9: Competition and cooperation
Section 10: Electrical interactions

Classification of building blocks

Section 11: Classification; patterns of generalization

2.3.2 Part 2 Energy

Section 12: Doing work
Section 13: Fuels and Food
Section 14: Waves
Section 15: Electricity and energy

2.3.3 Part 3 Interactions

Things are where they are, and what they are, because of a complex series of interactions. This will be the introductory theme to Part 3. 'Physical' and 'biological' systems will be considered together. The need for isolation of variables will become apparent and will lead to Sections 17-23, all of which will be subject biased (and so give the pupils some idea of what to expect at A level). Part 3 closes by considering three major problems, all of which require a deep scientific treatment.

Section 16: Distribution of building blocks
Section 17: Interactions of atmosphere, land, water and organisms
Section 18: Selection and evolution: an important interaction
Section 19: Interactions and patterns of motion
Section 20: The earth and its history: a further look at interactions of atmosphere, land, water and organisms
Section 21: Interactions of molecules
Section 22: Interactions of atoms
Section 23: Interactions of ions and electrons
Section 24: Some major problems

In this section the limitations of science will be stressed.

There are strong links with other school subjects in the sample scheme and so any wish to emphasize particular aspects of science or technology can be made.

2.4 The GCE O Level Examination

Pupils entering further education after studying Integrated Science will have a knowledge of the major areas of science. The double certification should allow entry to any course requiring two GCE O level science passes. Although a single pass will also be available, pupils must be entered for the whole of the examination which will be devised so that a double pass consists of Integrated Science A plus Integrated Science B. A single certificate may also be awarded and will be either a pass in Integrated Science A or in Integrated Science B. The nature of 'A' and 'B' will be such that they should provide a crude student profile. (It is likely that 'A' will emphasize facts and concepts whereas 'B' will emphasize problem solving.)

2.5 Pilot Schemes

At present 30 schools and about 2000 pupils are studying Integrated Science on an experimental basis. It is important to ensure that they receive special and sympathetic consideration when enrolling on courses of further education and it is hoped that for these the equivalence of the double certification to two GCE O level passes will be accepted as a reasonable experimental proposition by the various examining authorities in further education.

3. Schools Council Science 5/13 Project (see SEN 8:2, 11:2, 12:22b and 16:8)

The Schools Council Project Science 5/13 finishes its main work this summer, although some members of the team will be remaining in Bristol. The Project began in 1967 and was sited at the University of Bristol School of Education. The fundamental part of the work of the Project team was to identify broad aims and suggest specific objectives for children learning science. The objectives act as a guide to teachers in forming their own objectives relative to their own circumstances and helping them to help their children gather profitable experiences from their own environment and, where appropriate, to organise it usefully. Guided by such objectives individual children and groups of children can work purposefully at their own pace and at their own level. The principal aim of the teaching ideas and objectives set out in the 5/13 units is the development in children of an enquiring mind and a scientific approach to problems. The project recognises that attitudes of enquiry, objective judgment, personal responsibility and ability to work and organise one's work independently can be established in children at an early age.

The teachers' units suggest practical ways in which the different objectives can be achieved through investigations by children. Each unit consists of one or more books for teachers; some units, such as "Working with wood" or "Metals" cover a subject area in which children commonly work and which suggest related activities and objectives. Other units, such as "Change" and "Like and Unlike" will deal with themes interweaving with many aspects of classwork and will suggest ways of integrating with other subject areas. "Holes, gaps and cavities" will show how simple, everyday starting points may be developed. The material in the books is related to children's differing stages of educational development rather than to their chronological ages, since children of the same age, in the same class, probably have different mental capacities. The project books help teachers arrange work to suit each individual child by suggesting

objectives for their different stages of educational development. The project has chosen stages in children's educational development based on work by Piaget. These stages cut across existing boundaries of infant, junior and secondary schools. Stage 1 is related to children who are thinking intuitively and to those who have reached the early stages of concrete operations; Stage 2 to those in whom this stage is well developed and Stage 3 for those who are beginning to think with the aid of abstractions.

While children are developing in the middle years of schooling, the project aims to keep the freshness and investigational nature of the work they did in primary schools. Many of these children will now be at Stage 3, so they are invited to work in ways that develop their growing ability to generalise, to consider experiences, relate them to other experiences and so develop their patterns of understanding. Those who have not reached this stage of development will still have profitable work to do at Stages 1 and 2. It has been reported to the project that the least able children and some who are handicapped in other ways, make good use of the unit on "Early experiences".

The units do not constitute a syllabus, a course, or even part of a course. They are illustrations of ways in which a teacher might go about helping children to achieve objectives he or she has in mind for them. The books are published by Macdonald Educational, 49/50 Poland Street, London W1A 2LG. Already available are

"With Objectives in mind" price £0.95. This book sets out the basic thinking behind the whole project and discusses the objectives it hopes the children will achieve through working in science. It also suggests guidelines for teachers who wish to frame their own objectives.

"Early experiences" price £1.25. This book, which includes photographs in colour, shows how science with young children is primarily concerned with observing and gathering experience. It contains many suggestions for starting points and activities which embrace a wide spectrum of infant education. It has also been found useful with older, less able, children.

"Structures and forces", Stages 1 and 2, price £0.95. Structures of all kinds, from cobwebs to skyscrapers are looked at, together with the properties of the materials from which they are made and the balanced forces which keep them together.

"Working with Wood", Stages 1 and 2, price £0.95. This book is concerned with activities that can arise when children encounter wood and wooden things in an ordinary classroom context. It is essentially a book of practical suggestions supported by guidance about the choice and use of materials and tools.

"Working with Wood", Background information, price £0.95. This book complements that on "Working with Wood" Stages 1 and 2. If offers teachers factual information to increase their knowledge of wood and the use man makes of it.

"Time", Stages 1 and 2 and Background, price £0.95. The text shows how children gather an increasing awareness of the duration of events. It also contains background information about wider aspects of time, such as the calendar and biological time.

"Science from Toys", Stages 1 and 2 and Background, price £0.95. Toys provide a large number of starting points for nearly all branches of learning and so can encourage integration of subject matter. Furthermore, the work starts from child-centred materials and can gain impetus from highly motivated activities.

In preparation, available autumn 1972/spring 1973:

"Structures and forces", Stage 3

"Change", Stages 1 and 2

"Minibeasts", Stages 1 and 2

"Holes, gaps and cavities", Stages 1 and 2

"Metals", Stages 1 and 2

"Metals", Background

An affiliated book, "Using the environment" by Dr Margaret Collis, will also be published. It will also be available in 4 parts: Part 1, "Early exploration", Part 2, "Investigations", Part 3, "Tackling problems", Part 4, "Ways and means", and available summer 1973 "Change", Stage 3, "Trees", Stages 1 and 2, "Coloured things", Stages 1 and 2, "Ourselves", Stages 1 and 2, "Like and unlike", Stages 1, 2 and 3, "Toys", Stage 3, "Children and plastics", Stages 1 and 2 and Background.

The new address of the project as from September will be 19 Berkeley Square, Bristol, BS8 1HF.

4. Schools Council Environmental Studies Project 5/13 (See SEN 14:9)

This project has now completed its development phase and publication of the materials has commenced.

The publishers are Messrs Rupert Hart-Davis, Educational Publications, and the first publication to be available is:

"Book of Case Studies", price £1.50, which became available on 22.5.72.

The other publications, namely a "Teachers' Guide", "Starting from Maps" and "Starting from Books", will be available later in 1972.

The Case Studies in the first publication illustrate the work undertaken in schools in the field of environmental studies by children in the age range 5-13 years. They have been selected from a large number of studies produced by schools participating in this project. The studies indicate the different aims of environmental studies approach at various stages in a child's school life. At the infant stage the locality is seen to be used to advance the children's development in language and mathematics. The junior school studies broaden and deepen to involve not only the language and mathematics skills but also the study and social skills which are considered the co-activities of this approach. At secondary level, further development of skills and a growing awareness for some children of subject specialisations are illustrated. Through all the studies the interest and enjoyment of children and teachers involved in work of this type is apparent. The examples quoted range from rural environments such as a village survey and a cave to the urban environments of the docks and other industrial settings, as well as the obvious foci for interest in the home, the river etc.

5. National Association for Environmental Education

Environmental Education involves those disciplines which contribute to an understanding of man in his environment. There is an increasing recognition that the ecological understanding of the biophysical environment is an important factor for the survival of man. There is a deep concern about the quality of life and the problems of human society in the built environment.

The National Association for Environmental Education is an Association of teachers, lecturers and others concerned with education and the environment. Its members work in all types of schools, colleges, polytechnics and universities. They include representatives of all the disciplines involved in environmental education both from the sciences and the humanities. The Association presents the ideas of its members and continually promotes environmental education in discussions and constructive activities. National conferences and international courses are held regularly. To these come educationists and leading speakers on national world-wide environmental problems. Study conferences are designed to produce solutions to specific educational problems. Working Committees carry out research, construct examination syllabuses and outline possible courses and useful activities. The Association publishes the results of its work in Newsletters and an annual Journal. The Association takes part in the work of the Council for Environmental Education. Membership of the Association is available either on an individual, corporate, institutional or associated basis. The levels of subscription are: individual £2.00 per annum; corporate £0.60 per annum; institutional £3.00 per annum; associated £5.00 per annum. Further information is available from: The Treasurer, National Association for Environmental Education, Environmental Studies Office, Offley Place, Great Offley, Nr Hitchin, Herts. The General Secretary of the Association is D G Alexander, Education Department, County Hall, Bedford.

In 1972 the Association will hold a conference at Crewe College of Education, Cheshire, 1-3 September.

6. Physics Films

As a special supplement to Education in Science, Volume 9, No 48, June 1972, the Association for Science Education has included a select list of some 186 physics films which have been selected from a very much larger list in "An index of films concerned with Physics" compiled for the National Council for Educational Technology. This select list is intended to draw attention to those films which the selection panel feel are most appropriate for one in teaching modern courses in physics. Education in Science is available from the Association for Science Education, College Lane, Hatfield, Herts, England, price £0.25 per issue plus postage.

7. Sixth Form Science Topics: ICI Publications for Schools

ICI have recently published booklets on the following topics for VIth formers: Catalysts, Colloids, Colour chemistry, Fertilisers, Polymers 1: long chain molecules, Polymers 2: synthetic fibres, Polymers 3: plastics, Spectroscopy.

These 8 publications resulted from a symposium organised by ICI in 1971. The object was to produce a collection of up-to-date material written at the right level and directly useful in the teaching of VIth form chemistry. The symposium was an experiment in collaboration between industry and schools and it is hoped that these publications will be used in an experimental fashion. Each is intended to be the starting point of a project rather than

an instructional text. Questions are asked as well as answered and readers are pointed towards further texts and experimental work since no attempt has been made to give complete coverage of each topic. It is hoped that it will be possible to build up a folder of material around the booklet adding newspaper cuttings, magazine articles, photos, graphs and essays so that the result is a growing collection capable of being used in many different ways. Eight writing teams produced the bulk of the texts during a 3 day symposium at the University of York in autumn 1971 though most of the writers had met and corresponded in the months leading up to the symposium. Apart from the people who were involved in the writing at York a considerable number of others, both teachers and ICI scientists, were consulted and made valuable contributions. The general editor is R A Finch, Schools Liaison Officer, ICI Ltd, Imperial Chemical House, Millbank, London SW1. The booklets are obtainable, price £1.00 per set of 8 different titles, from the Kynoch Press, Thames House North, Millbank, London SW1.

8. Decisions Kit No 2

In May of this year the second in the "Decisions" kit series, this one entitled 'Coastal tankers', was made available. The kit is in a series of 6 based entirely on real situations and supported by real data. The series was produced with the broad aim of providing students with an idea of the range of activities involved in industrial planning and an appreciation of the social implications of industrial employment besides giving them a grasp of business principles. Decisions 2, 'Coastal tankers', involves the planning, financing and operating of a part of the Shellmex & BP fleet which altogether supplies oil products from Shell & BP refineries to some 70 distribution terminals around the UK coast. The problems posed involve investment decisions, assessing plant requirements, cost efficiency and work study and productivity bargaining with Unions.

The idea of the series was put forward by Shellmex & BP 2 years ago to provide a link between school and industry. The first decisions kit, 'Siting an oil terminal', was produced in co-operation with Bath University in March 1971. Like Decisions 1, the new kit has been tested by 10 public, grammar and secondary schools in the South West of England and for Decisions 2 the training section of a leading industrial group has been added. The kit itself, designed for a class of 16 working in groups of 4 but adaptable to larger or smaller numbers, is in 3 sections:

8.1 The data bank containing all background information, tables, charts, maps, statistics, pictures and extendable calculation sheets.

8.2 Students' text - 9 copies of a booklet which details the problems.

8.3 The teacher's guide which indicates ways of mounting the project to the students.

The material is packed in a specially designed and durable case and costs £10 per kit complete with packing and postage. The kits may be obtained from the School Government Publishing Co Ltd, Shellmex & BP Ltd, Darby House, Bletchingley Road, Merstham, Surrey.

ACTIVITIES IN BRITAIN - MATHEMATICS

9. Schools Council Secondary School Mathematics Project: Mathematics for the majority (See SEN 12:9, 14:14, 17:8, 18:20)

The Project came to an end on 30 April of this year and the final newssheet was published in the same month. A continuation project, is now in operation (see SEN 17:9).

Publications of the work of the project are:

Mathematical experience: This book discusses the aims of the project and includes contributions from teachers who are actually concerned with teaching mathematics at this standard. Price £0.43.

Machines, mechanisms and mathematics: This book is a brilliant and stimulating survey of many forms of simple mechanisms which we all meet in our everyday life with a discussion of the mathematical principles underlying them. Price £0.60.

Assignment systems, price £0.30. Assignment cards can play an important part in mathematics teaching at this level and this book discusses methods of preparing them and gives numerous examples.

Luck and Judgment, price £0.80. A classroom approach to probability and statistics. The activities in this book provide the pupil with a practical basis for classroom discussions through which he may appreciate some of the ideas of probability and statistics.

Mathematical pattern, price £0.53. This book brings together from a variety of branches of mathematics topics in which an element of pattern is strongly emphasised.

Number appreciation, price £0.75. This is a guide to dealing with the number systems in common use and with some of their properties.

Mathematics from outdoors, price £1.15. The increasing number of teachers who look for mathematical ideas outside the classroom will be helped by this guide, which is concerned mainly with simple surveying and navigation.

All the above books are obtainable from Chatto & Windus Ltd, 40-42 William IV Street, London WC2N 4DF.

10. Nuffield Mathematics Project (See SEN 8:3, 12:5)

A further book has now appeared in the series produced by the Nuffield Mathematics Project. Entitled 'Computers and Young Children', it is published by Chambers, Murray & Wiley, price £1.20. The book is an introduction to the thinking behind computers rather than to the mechanics of them. It covers flow diagrams, punched cards and games in which children simulate a computer and ends with a description of work done in a few schools with an actual computer. It includes work for juniors and lower secondary children and it is intended to be used from time to time rather than as a concentrated course.

A second publication from this project entitled "Logic" has been published by Chambers, Murray & Wiley, price £1.30. This book is an introduction to logic in a very general sense. Its main aim is to help children aged about

8-13 to think clearly and logically. In mathematics, and still more in mathematical logic, language is used very precisely and the meanings of some commonly used words and phrases, for example 'or' and 'only if', are restricted to just one of the meanings they bear in everyday life. In this book children are encouraged to consider how they use the logically important words and to express themselves as clearly and unambiguously as possible. But it is not suggested that they should adopt the conventions of mathematical logic in their use of language. For this reason, although 'and' and 'or' and 'not' and 'if' are considered in some detail truth tables are not introduced, for they are too rigid to be usefully applicable to ordinary language and when they are prematurely introduced highly artificial examples are generally needed to illustrate their use. The emphasis in this book is on language as it is actually used in everyday life. Many of the children who could usefully do work of the kind suggested in this book will never study mathematics or logic to the point at which a specialised language is needed. There is rather less children's work in this book than in most other teacher's guides; much of the work can best be done orally and the written work, except in the early stages of sorting and classifying, does not usually require any colourful drawing. Many specific problems for children are suggested. These are enclosed in boxes as in other teacher's guides. However, in this field more perhaps than in most fields, problems suitable for one child will not necessarily be suitable for another and the teacher will often need to modify the suggested problems or replace them, as well as to supplement them by further examples.

11. <u>The National Computing Centre Ltd (NCC) - A New Information Service for Schools and Colleges</u> (See SEN 11:10, 15:9b, and 17:17.6)

For some years, many professional bodies have in their separate ways contributed to the sum of knowledge about the methods and means most suitable for the development of computer education in secondary schools. The efficient and proper implementation of these ideas within the secondary sector has been impeded by a lack of communication between these professional bodies and those who are seeking information: teacher, headmaster, adviser and local authority.

During the last twelve months a working party was set up to consider the solution to this problem, The outcome was the formation of an Information Co-ordinating Committee comprising representatives from the NCC, BCS, IBM and ICL, the Computer Education Group and observers from the Department of Education and Science and the Scottish Education Department.

The Co-ordinating Committee recommended that a Computer Education Information Service be established for teachers in Schools and Colleges. With the help of a grant from the DES and financial support from IBM and ICL this service is to be established at NCC in Manchester for an experimental period of two years.

The service will complement and replace the present schools information work performed up to now by the NCC Education Information Officer, who will now be able to concentrate more fully on information support to the rest of the Applications, Methods and Education Group. It is expected that the service will, in time become self-supporting, its income deriving largely from contributions from local education authorities and institutions of further education.

A Communications Officer, Mr P Lambert, has been appointed to run the service on behalf of the Information Co-ordinating Committee and he will be starting his duties in Manchester in July. The Communications Officer will manage the information service and will be responsible for the following activities.

Information Leaflets

To prepare, maintain and distribute information leaflets and resource lists concerning matters relating computers and education on both a national and a regional basis.

To negotiate with organisations responsible for the sources of such information concerning the maintenance and reliability of this information. Where information has not been approved by the committee, such documents as may be distributed by the service must carry a suitable disclaimer provided by the source organisation.

To develop and maintain a coding system for all information available within the service and to standardise the format of all documents originated by the service.

Newsletter

To edit and distribute a newsletter for schools in the UK in co-operation with present organisations undertaking this task.

This newsletter will outline the various activities of the information service, the leaflets and information available within the service and will provide up-to-date information about new developments, courses equipment etc.

To be responsible for distribution through centrally controlled mailing lists or through nominated local distribution centres eg Polytechnics, Teachers Centres, LEA's.

Journal

To be responsible for the co-ordination of articles within the newsletter and the Journal "Computer Education".

The Communications Officer will take full responsibility for the content of information leaflets and newsletters and in due course will act as production manager for the journal "Computer Education", working in conjunction with editors appointed by the Computer Education Group.

A recent announcement from the Department of Education and Science stated that "The advent of such a service is especially welcome at the present expansive stage in computer education, in which there is a need for reliable and up-to-date information which will help local education authorities, schools and colleges to make sensible decisions regarding the equipment and other facilities they require.

12. Scottish Computers in Schools Project

This is an introductory course in computer appreciation and is designed for the majority of pupils, ie the average 13-15 year olds. The course stresses the appreciation/general knowledge aspects of computers and the mathematics is kept to a minimum. It is designed so that the course need not be taught by a mathematics specialist but could be suitable for use by teachers of any discipline, be they teachers of commercial subjects, classicists or mathematicians. There are separate teachers' books which explain the contents of the pupils' books without the proliferation of examples which makes them more continuously readable. Alone, they provide a background to computer studies; together with the pupils' books and workbooks they form an introductory activity course.

The course is extremely flexible. In its entirety it provides ample material for those with a generous allocation of time but teachers with less time at their disposal may select one or two of the three main parts. Pupil activity is an integral part of the course throughout. This is ensured by the workbooks in particular. In them the exercises in the pupils' books are to be carried out and they provide the necessary pieces for a model computer so that each pupil can simulate the way in which a computer works. They also provide sticky-backed cut-outs for constructing partly prepared flow charts to illustrate a very wide range of computer applications.

Programming appears at the third stage (Pupils' book 3) where the various options in programming are studied. The third part of the course will also consist of parallel texts using those languages most relevant to schools. The position will probably become clearer within the next year or so but it is expected to start with Algol, Fortran and Basic. It is possible that SLI may follow later.

Apart from the books there are full colour slides taken specially for teaching purposes in general and for teaching this course in particular.

The materials of the course are:-

Part I - Understanding the Computer

Pupils' Book 1, Computer Bits & Pieces, price £0.70.

Pupils' Workbook 1, price £0.60

Teachers' Book 1a, Introducing the Computer, price £0.70

Teachers' Book 1b, The Computer Thinks?, price £0.80

Teachers' Book 1c, The Computer becomes Literate?, price £0.75

Teachers' pack comprising the 3 teachers' books and 24 35mm slides in full colour all packed in acetate folder and box, price £6.00 net.

The Part 1 materials are now available.

Part 2 - Applications-Projects

Part 3 - Various options in Programming

These materials are in preparation; Part 2 will be available in spring 1973.

The 24 slides are as follows:

1. Paper tape reader
2. Punch card reader showing hopper and backer
3. Reading mechanisms of card reader
4. Central processing unit: core store
5. Central processing unit: arithmetic/ logic unit and control
6. Line printer
7. Teletype
8. Card punch
9. A selection of ferrite cores
10. Core plane
11. Close-up of core plane
12. Circuit board with transistors etc
13. Circuit board with integrated circuits
14. Magnetic tape handler
15. Magnetic tape library

16. Loading a magnetic disc
17. The disc loaded
18. Disc library
19. Console
20. Graphical display unit
21. Close-up of graph plotter
22. Graph plotter with typical output
23. Graphical display unit and light pen
24. General view of computer system

The books and slides are available from W & R Chambers, Education Department, 11 Thistle Street, Edinburgh EH2 1DG.

13. Computer Games for Education

These games called Bicode, Intercode and Multicode are described as a progressive system of number learning for students of all ages and abilities. Computers are the concern of everybody. The present student generation is the first to be born in what can be called the 'computer age'. It seems a reasonable precept therefore that students should be introduced to computers at as early an age as possible. It is sufficient if, at every age/ability level from junior upwards the teaching method is so orientated that pupils simply associate the relevant parts of the curriculum with computers as a natural process. In this way the whole idea of the computer is accepted as naturally as reading, writing or counting. These computer games have been developed by Messrs Griffin & George in the Griffin junior studies series to serve this specific purpose. The games can be used as a preliminary to, and in conjunction with, accepted teaching of bases. Standard methods, however, tend to rely on an abstract number theory relieved by pictorial treatments and the use of such devices as the Abacus. By comparison the Griffin Computer Games approach the subject in a form which is directly related to the computer.

Bicode is a game which, at the simplest level, provides the matching binary numbers with the equivalent decimal ones. At this level its purpose is to allow the pupil to familiarise himself with the binary code through play without previous knowledge of bases.

Intercode takes familiarisation a stage forward. Through playing Intercode pupils learn the relationship between - and how to convert - the classic computer codes (binary, octal and binary coded decimal).

Multicode uses the same principle to provide familiarisation of and insight into bases. It uses all bases from base 2 (binary) to decimal (base 10).

All three games in the set are inter-related so the teacher can use them either singly or collectively to suit his own method. Further, by using simple variations to the rules (detailed in the pamphlet 'Suggestions for Teachers' included in each set of computer games) he can regularly adapt Bicode, Intercode or Multicode to any age/ability level. The variations are arranged in ascending order of interest and difficulty covering all grades from very young pupils, or older pupils who have little facility with numbers, to secondary and even adult levels. It is suggested that these games are suitable either for mixed classes or for progressive schedule where as soon as any group of pupils become familiar with one of the games at one level it is introduced to the next.

The pack of three games costs £3.50. Griffin catalogue code number J08-100, Griffin Computer Games. For further information consult local Griffin agents or write to Griffin Junior Studies, PO Box 13, Wembley, Middlesex HA0 1LD, England.

14. Association of Teachers of Mathematics. Annual Conference. 10-14 April 1972 St Luke's College, Exeter

The annual conference was attended by some 230 mathematical educators including approximately 30 from overseas.

The conference was organised on the basis of seminar groups and workshops. A wide range of seminar groups was arranged to cover most aspects and levels of mathematical education. Each seminar group met three times. Workshop activities (mathematical games, film making and working with materials) were also available. A series of three meetings on "Mathematics Overseas - Problems and Prospects" were arranged to provide an opportunity for overseas participants to discuss their particular problems and interests. These meetings, taking place in addition to the normal conference programme, were organized with the approval of ATM by B Wilson (CEDO) with assistance from G P Thompson, British Council. Additionally a small display of material produced in overseas countries was mounted by the Centre for Educational Development Overseas (CEDO) and the British Council.

The conference met three times in plenary session. A Bell (Nottingham College of Education) opened the conference with a lecture on "End Points". A Bishop (Department of Education, Cambridge) closed the conference with a lecture on "Research in Education". The third plenary session was a symposium "Why teach mathematics?" arising out of the work done in one of the seminar groups.

Of the overseas group meetings, the first meeting was led by four members of the Commonwealth bursars course at Southampton University: J P Lebona (Lesotho), A N Ong'Idi (Kenya), J K Bahikirwe (Uganda) and G O Iwambe (Nigeria). Mr Lebona spoke of some of the general problems facing developing countries: lack of well trained teachers, shortage of suitable reading materials and learning aids for both pupils and students and the possibility of a clash between traditional culture and modern views on education. The other contributors concentrated on the particular difficulties they felt were faced in their own countries.

The second overseas meeting was led by M Macrae (formerly a teacher in Nigeria) and focused on the particular problems of teacher training, the role of the inspectorate and the possibility of using local materials in place of highly expensive imported educational aids.

C K Chanase (Ghana) introduced the third overseas session and spoke in detail of Ghana's attempts to train and re-train teachers so that they could introduce modernised content and methods in the schools. He emphasised the role of in-service training and the usefulness of Mathematical Association of Ghana (MAG) annual conferences as a means of exchanging ideas and mutual stimulation. In both of these the Ministry of Education played a crucial role by making it financially possible to hold both in-service courses and annual conferences of subject associations.

The overseas group meetings were attended by nearly all the overseas participants at the conference and other interested conference members. The sessions provided an opportunity to exchange views on the problems faced, and the ways in which they are being tackled, in a number of different countries. Lively discussion was provoked by the leaders of these three sessions.

ACTIVITIES IN BRITAIN - GENERAL

15. METRICATION

15.1 Education for Metrication

In 1965 the British government declared its policy that metric units should replace imperial units in Great Britain by 1975. This position was reaffirmed by the Minister of Technology in 1969 and in the same year the government established the Metrication Board to provide guidance and a central point of liaison for all sectors of industry, commerce and education. Strict programming along lines similar to the decimilisation operation was not considered feasible due to the varying degrees of conversion which had already been taking place in the different sectors, especially industrial, in response to the demands from the many countries which had already gone metric. The changeover was to be entirely voluntary and, with the exception of small changes relating to the designation of some consumer goods, no major legislation was anticipated. The only major principle which was to be applied at all stages and levels of the changeover was that people were to be encouraged to "think metric" rather than carrying out mental conversion from metric back to imperial. The emphasis throughout has been on the rapid and total implementation of a new system rather than on a process of conversion which would extenuate the changeover period.

90% of the world's population live in metric using countries and in the different countries the industrialists, scientists and engineers have tended to evolve different systems of metric units to suit their particular needs. International matters on metrication are the responsibility of the Conférence Générale des Poids et Mesures (CGPM) first convened in Paris in 1875. In order to rationalise the multiplicity of usage of the metric system, the CGPM agreed in 1954 to adopt a coherent system of measures based on the four MKSA units. The addition in 1960 of two further units, the kelvin (symbol: k) for thermodynamic temperature, and the candela (symbol: cd) for luminous intensity, gave rise to the full Système International d'Unités, abbreviated to SI, founded on these six basic units. Although not formally adopted until 1971, the unit of the mole (symbol: mol) has been in continual usage to denote the amount of a substance. The SI system therefore consists of seven basic units.

In this coherent system there is always just one basic or derived unit for any one physical quantity. Derived units are obtained by multiplication of the basic units without the introduction of any additional numerical factors. Multiples or submultiples are indicated by using one of a series of approved prefixes. In addition to the basic and derived units there are two supplementary units, for the plane angle, the radian (rad) and for the solid angle, the steradian (sr). Several units such as the hour (hr), minute (min) and degree Celsius (^{o}C), although not part of the SI system, are to be retained because of their convenience for everyday use.

15.2 Schools

15.2.1 The metric system has been taught in schools and colleges for many years and the transition to the exclusive use of metric should come as a natural progression. The 'bilingual' approach is still needed at secondary level for those students who leave school during the transition period and who may have to work with both metric and imperial. At primary level the transition has been more total although somewhat impeded in the early stages by lack of equipment and poor quality design of some metric apparatus. These initial problems are now largely solved and metricated books and equipment are freely available. The retention of non-SI units in some sectors may prove an unnecessary complication to an otherwise advantageous changeover.

15.2.2 General guidance and advice has been provided in the form of publications by the Department of Education and Science, by the Schools Council in collaboration with the Metrication Board, and by many professional organisations. Ultimate responsibility rests with the teachers and most local education authorities have provided in-service training courses on problems of metrication in schools. Similarly oriented short courses for teachers have been run by Colleges of Education and Technical Colleges. Many local authorities have produced their own literature for teachers giving advice on metrication in subjects with particular problems such as Craft and Domestic Science. The changeover has been facilitated by co-operation between the education authorities and bodies such as the Metrication Board and various teachers' professional organisations, and by the anticipation of local education authorities, most of which have made a per capita allowance for the purchase of metric equipment.

15.2.3 By the end of 1972/73 nearly all examinations will require the use of metric units. The changeover has been phased over four years during which time imperial and metric units were available wherever desirable or alternative papers in metric and imperial were offered. Alternatives have been especially necessary in technical subjects where availability of metric equipment has not always allowed conversion to go as fast as was hoped. It is estimated that total conversion of examination papers to metric will be completed by 1976.

15.2.4 A variety of charts, posters, visual aids and general equipment is now produced by commercial organisations, and individual industrial training boards. The Publishers' Association has been working in collaboration with the Metrication Board to supervise the gradual conversion of literature to metric.

15.3 Industry

The various sectors of industry have been changing to metric at different rates but it is expected that changeover will be completed in all cases by or before 1975. It is the responsibility of individual training boards to supervise the conversion in their sectors and to this end they provide information documents and basic and specialised learning texts. The boards work in close co-operation with their respective Steering Committee of the Metrication Board.

15.4 Equipment

15.4.1 General

A standard range of school equipment is produced by a variety of manufacturers. Such equipment includes metric rulers, trundle wheels, calipers, cubes of various sizes etc for the teaching of units, and standard scientific equipment calibrated in metric. Several manufacturers produce metric adhesive tape for conversion of existing equipment scales or for use as environmental accessories for marking desks, doors, pencils and other common articles to encourage the principle of 'thinking metric'.

A small committee set up by the Metrication Board in collaboration with the British Standards Institution has been investigating problems of school equipment design. Recommendations are to be made to BSI for establishing appropriate standards in a wide range of measuring equipment which will carry a kite mark to denote quality. Such equipment may be more expensive but it should be an advantage for a school to have at least one set of reliable equipment for reference.

15.4.2 Specific

There is now an extensive range of materials and media packages specifically designed for people faced with the problem of converting to metric.

15.4.2.1 Wallcharts and Posters

Pictorial Charts Educational Trust, 132 Uxbridge Road, London W13.
Set of 5 posters illustrating everyday units of length, area, volume, capacity and mass.
Price of set £0.63

Metric Relationship: single chart illustrating the relationship of the metric units of length, cubic capacity and liquid measure.
Brief notes for teachers' guidance are provided.
Price £0.63

The SI Family Tree showing how various physical quantities are all derived from the six basic units and the two supplementary units of SI. Teachers' guidance notes included.
Price £0.63

BP Educational Service, Darby House, Bletchingley Road, Merstham, Surrey.
Posters designed to give feeling of everyday objects expressed in metric terms.
Mass, volume, temperature, pressure, area, length, speed, consumption, heat.
Price £0.25 each.

International Printers Ltd, M & S Mailing Services, Norman Road, Thurmaston, Leicester.
Wall chart 841mm x 1189mm printed in four colours. Explains in simple diagrams with clear and concise definitions the six basic methods of measurement. There is also a table of relevant equivalents and conversions.
Price £0.75 per copy (reductions for bulk orders)

Northwood Metric Services Ltd, 189 Regent Street, London W1R 7WF.
A1 size wallchart illustrating metric and preferred dimensions of 300mm, 100mm, 50mm, 25mm in contrasting colours. The chart gives three examples of metric areas to aid recognition.
Price £0.30 each (£18.00/100)

SI Metric Map - comprehensive chart of A1 size showing the coherence of the system of measurement and the relationship of the six basic units.
Price £0.75 (discount offered on bulk orders)

15.4.2.2 Metric kits

James Galt & Co Ltd, Brookfield Road, Cheadle, Cheshire SK8 2PN.
Discovering mathematics by H M Morris LCP. Over a hundred assignment topics providing a scheme of practical activities for Infants and Juniors leading to the introduction and use of the metric system. Consists of five sets of 12 cards (250mm x 200mm) clearly printed on both sides of white art board, self contained in plastic wallets. Title card gives information for teacher, contents of scheme and a list of apparatus required. No special apparatus is required except that normally present in primary schools.
Price per set £0.49

Using Metrics by H M Morris LCP. Two sets of 24 work cards each (25cm x 20cm) providing work in mathematics for older or brighter juniors and children in middle school range. Title card gives contents of scheme, suggestions for teacher and list of apparatus required.
Set 1. Relationships and formula price £0.49
Set 2. Experiments and problems price £0.49

The Educational Supply Association Ltd, School Materials Division, Pinnacles, PO Box 22, Harlow, Essex.
Metrication sets of basic metric equipment retailing at 12½% discount on cost of individual items.

Set A (5786/789)

Metre rule, one edge in alternating colours every 25cm.
Metre rule, one edge in alternating colours every 10cm.
Metre rule, one edge graduated in cm and mm. Figured in cm.

Metre rule, one edge graduated in cm, the other in cm 5mm and mm. Figured every 10mm.
Metre rod, four faces. Alternate colours every 50mm, every 25cm, each 10cm with the first 10cm graduated in cm, 5mm and mm, and each cm.

Tape measures, plasticised linen tape graduated in cm, 5mm and mm. Figured in cm.
a. 100cm long. b. 150cm long

Metal measuring tape graduated in cm, 5mm and mm.

Demonstration calipers to measure up to 60cm.
Squared paper, packet of 25 sheets of white newsprint 50cm and 50cm ruled with 2500 1cm squares.

Coloured gum strips, packets of 100 each in assorted colours of:
1 cm width, 200cm long 2cm width, 20cm long 5cm width, 20cm long 1cm width, 20cm long printed in black at 1cm intervals.

Self-adhesive tape printed in red on yellow with cm and 6cm in alternating colour. Roll approx 65cm long and 2cm wide.
Set of 'weights', masses 10g 20g in brass; 50g, 100g, 500g, 1kg in cast iron.

Set of capacity cubes in tough transparent plastic with open tops. 125ml, 250ml, 500ml, 1 litre.

Set complete £11.40

Set B (5796/792) As for set A with addition of equal pan scale.

Set complete £14.20 + 17½ PT.

Encyclopaedia Britannica Instructional Materials Division, Dolcis House, 87-91 New Bond Street, London W1.
Produce a multimedia package "Primary Schools Metrication Programme".
Consists of:
A 35mm full colour 64 frame film strip depicting the history of weights and measures and the application of the metric system.
A synchronised tape giving a clear informative commentary.
Teachers' notes in booklet form.
Classroom quantities of 12 different work cards.
Metrication wall chart.
Price £7.25

Northwood Metric Services Ltd, 189 Regent Street, London W1R 7WF.
The Metripack system marketed by Northwood Metric is a training package comprising a series of training modules each complete in itself. The metripack programmed for an individual will contain only a selected number of modules which are considered appropriate to the person's needs. This system was originally designed for the training of industrial management staff of the engineering industry. Northwood also market a minipack containing simplified training booklets.
The following educational materials employing training modules are available from Northwood.

Special Pack designed to help primary school teachers to convert to metric. This is an individual teacher's pack.
X-7-J : £12.30

Special Pack for Secondary School teachers.
X-7-H : £15.90

School Visual Aids Pack comprising:

Metric cube	(module 151)	5 copies
Metric wall chart	(module 152)	5 copies
7 posters covering length, area, volume, pressure, power, mass, temperature		1 set
Metric map		2 copies

Price £3.00

Programmed instruction modules suitable for O and A level use, covering the arithmetic of metrication, eg Indices, negative power and roots etc and application of SI to power, pressure and stress, energy, density, momentum, in units of 30 modules suitable for classroom use.
Price £5.10 per pack

Slide/tape presentation "Let's go Metric". For 12 year olds upward. Traces history of SI and introduces its advantages.
Price £15.00

Technical College Pack containing one lecturer's metripack (X-7-G) and 30 copies of each of five modules.
Price £60.00

15.4.2.3 Films

"Learning Metric". 16mm black and white. 26 minutes. Produced and still available in videotape by Audio Visual Centre of Hull University for the Metrication Board. Intended as an introduction for teachers of older primary children to the problems of teaching metric, presenting contextual situations and inviting teachers thoughts and comments. Available from Central Film Library, Government Building, Bromyard Avenue, Acton, London W37 JB.
Price £26.25

"The Metric System". 16mm colour, black and white. 13 minutes. This film is produced by McGraw Hill Text-Films and is suitable for use in mathematics and science classes from top primary to the middle of the secondary school. The aim of the film is to present the metric system as a set of units with easy-to-remember interrelationships which lend themselves to convenience in calculations. Full details available from McGraw Hill Book Co (UK) Ltd, Shoppenhangers Road, Maidenhead, Berkshire, [illegible].
Price £61.60

15.4.2.4 Other Aids

A folding card cube of 1 litre capacity, each 100mm^2 face of which gives basic information on the SI system. Printed in four colours. Other faces give a simple guide to length, area and volume: metric multiples and submultiples, and the scales recommended for use with the metric system.
Northwood Metrics.
Price 25p each (£15.00/100)

15.4.2.5 Games

Metr-o-Poly: family card game teaching length, breadth, volume, temperature. Gives "anchor" points throughout the SI system.
Northwood Metrics.
Price £0.50

Metre Rummy: metric measurement game for four. Children collect cards in pairs to make a metre.
James Galt & Co Ltd
Price £0.37 (PT£0.09)

15.5 Information Sources

Metrication Board: produce a variety of information leaflets on the origin and usage of SI units.

Industrial Training Boards: produce technical and advisory information about the conversion to SI in the particular industries.

Northwood Metric Services: operate the 'Metric Information Service' comprising news and information on metric topics, materials and products. The information is presented in three colour-coded publications under 12 headings, separated into General, Official, and Trade and Technical.

General: introduction and news abstracts from newspapers and general periodicals (non-technical). Book reviews and bibliographies. Training news and courses. Price for General section only: £7.50/annum.

Official: introduction and news. International news. ISO[2] recommendations, standards etc. BSI[3] lists. Official Bulletins. Price for Official section only: £7.50/annum.

Trade and Technical: product news from industry. Technical abstracts. Data sheets and technical reference sheets. Suppliers index and buyers guide. Price for Trade & Technical section only: £13.50/annum.

Custom built filing boxes are provided to house the four subsections of each of the three major categories. Price for full service: £21.00 (3).

Northwood also produces a monthly newspaper "Metrication News" which includes abstracts of any reference of general interest in the field of metrication. Subscription to the Information service includes "Metrication News" which is available on its own for an annual subscription of £4.00.

(Reductions are available for multiple orders)
(OSI : International Organisation for Standardisation)
(BSI : British Standards Institution)

15.6 Select list of Publications on Metrication

1. "SI Units, Signs, Symbols and Abbreviations for use in School Science". Report issued by the Education (Research) Committee of the Association for Science Education. 1969. £0.27 (postage £0.05).

2. "Metres, Litres and Grams: metrication in the primary school" Schools Council published by Evans/Methuen Educational. 1971. SBN 423 46520. 40pp. £0.30.

3. Metric Units: an International System. Metrication Board. HMSO. 1970. 12pp. £0.05.

4. The Use of SI Units. British Standards Institution. PO 5686. 1969. 26pp. £0.40.

5. Metrication in Schools. DES Education Information. Sept 1969.

6. Going Metric - Implications for the Primary School. Scottish Education Department, Curriculum Paper 4. 1969. HMSO. £0.07.

7. Going Metric - Implications for the Secondary School. Scottish Education Department, Curriculum Paper 5. 1968. HMSO. £0.11.

8. Article "Metrication in the School Curriculum" by Edith Biggs. Trends in Education No.26, pp.35-40. April 1972. HMSO. £0.18½.

9. Metrication and the Schools. The Metrication Board 1969. HMSO. Free leaflet.

10. "Metrication" 13 page lecture notes produced by the Womens' Advisory Committee of the British Standards Institution. (re 71/96040) Price £0.05.

11. Metrication. Edited by F W Kellaway. Penguin Education. 0 14 080026 19. £0.30.

15.7 Bodies particularly involved in Metrication

1. The Metrication Board, 22 Kingsway, London WC2B 6LE.

2. The British Standards Institution, 2 Park Street, London W1. Sales Branch: 101-113 Pentonville Road, London N1.

3. Industrial Training Boards. (There are 28 of these)

4. Individual Local Education Authorities.

5. Teachers' Professional Organisations.

16. THE OPEN UNIVERSITY

16.1 New Courses

The Open University entered its second year of studies in January 1972 and a new foundation course was offered in addition to the four commenced in 1971. This course is in technology and is entitled "The Man-Made World". For students in mathematics and science who have completed the foundation course, second-year courses are now available and are being followed for the first time in the 1972 academic year. In addition, at the second-year level, two courses on

educational studies have been introduced. There are three elements within this: a course on Personality, Growth and Learning, a course on School and Society and a course on Environment and Learning.

16.2 The Man-Made World - a foundation course

The prospectus introduces this course as follows:

"Today the effect of technology on society is greater than ever before and not all of it is beneficial.

The aim of the course therefore is not only to explain and demonstrate the many aspects of the way engineers, designers and others do their job, but also to assess its impact upon us all.

Technology is not just applied science or applied mathematics or a collection of inherited skills though they all play a part. It is creative and imaginative, it has a methodology all its own and it is to do with people. Thus our course is both for those who want to have a hand in shaping society but have never before encountered technology, as well as for those already involved in it and who want to extend their ability and insights. No special prior knowledge of science or mathematics is required."

The course includes case studies drawn from the man-made world which demonstrate how necessary it is to balance the conflicting demands of individuals in groups in society, the relative merits of different materials, the limitation of technological achievement at a cost which can be afforded, etc. Topics will include transport, education by satellite, chemical processing and the manufacture of steel and plastics. "The course will emphasise the important aspects of technology. First, technologists need to use and understand, and perhaps augment, the findings of research and development over a wide range of topics from physics and chemistry on the one hand to some study of society, its cultural needs and economic and political problems on the other. Second, in order to think and design creatively a technologist should be able to break his problem down into realistic simplifications having first taken pains to be sure that he knows the full implications of his task, the discipline we call modelling. The third aspect to be emphasised is that of the general strategies an engineer can adopt to implement his design. The principles of feedback and control, of optimisation, of linear-programming and of simulation will be studied, as will the techniques of systems design, quality control, instrumentation, data acquisition and computation."

As in the case of the foundation course in science, the foundation course in technology includes a series of practical experiments and in connection with this some ingenious apparatus has been produced. Notable examples of this are the Sound Level Indicator which has been produced for the Open University by Castle Associates. This is a simple, robust, battery-operated instrument which can measure any noise-levels in the range 36-110 dBA, the extremes of which correspond at one end to a quiet rural background and at the other end to a jet aircraft passing closely overhead. The instrument, of course, could be of particular value in other contexts as well as in the context of the experiments designed for the Open University course. The price of the Sound Level Indicator is £28. Another example is the 'Bobcat' which stands for Ball Operated Binary Calculator And Tutor, which has been developed by Pip Youngman in connection with the Technology foundation course. This is a simple mechanical analogy aimed at helping people to understand computer operation and the aim of the 'Bobcat' is to demonstrate visually the extreme simplicity of the bricks from which even the most complex computer is built. As the name implies, the device is intended to familiarise the user with the setting and reading of binary numbers. From this the 'Bobcat' demonstrates the feasibility of automatic computation using fundamental logic units. It is supplied with a 16 page instruction brochure which contains notes on the binary system and full operating instructions for the various experiments which can be performed with it. The 'Bobcat' kit costs £7.95, but it is not yet available for general sale.

Any study of the modern world inevitably requires an understanding of the more complex technological processes that surround us, particularly of electronics and of computers. Three units have been designed to enable the student to familiarise himself with electronic circuits, emphasising their importance in the construction of computers. While they have been designed specifically as teaching aids for the Open University's Technology Foundation Course, they are available as separate items and may be found appropriate for the conventional educational contexts. The three units are: a Power Supply-Meter kit which provides a steady power supply for external circuits and also acts as a complete test facility for a range of experiments on electrical resistance, price £23; an Analogue/Control kit designed to teach simple analogue computing and the characteristics of simple control systems, price £15; and a Logic Tutor designed for teaching logic manipulation and logic circuit design, price £22. The Open University Texts T.100 7-8 Electricity and Magnetism, £1.10, T.100 12 Automatic Computing £1.00, T.100 13-14 The Heart of Computers - Computer Systems, £1.30, and T.100 15-16 Analogue Computing: Control, £1.40, are directly connected with the use of these three kits.

Full details of all these developments are available from The Marketing Division, The Open University, Walton Hall, Walton, Bletchley, Buckinghamshire, UK.

16.3 Department of Educational Studies: Second level courses

Educational studies only become available at the second level at present in the Open University and there are, as stated above, three courses, each of which has a ½ credit rating in the Open University system. The first of these is called 'Personality, Growth and Learning'. This course is intended to enhance the understanding and management of learning in children and young persons by examining the effect of the personality of the learner on his learning. The course will not attempt to cover the entire field of personality and learning but will use a topical approach to examine the interaction of personality and learning in a series of case studies on motivation, adjustment and learning style. The course will be particularly valuable for teachers and others who are concerned with the learning of children and young people. The topic presented will arise out of the school and other settings.

The second course is called 'School and Society'. It is a study of social process and social interaction within the school. It concentrates upon an analysis of the kinds of commitments and capabilities which schools develop within their pupils. The perspectives derive from the sociology of knowledge. Teachers and pupils are seen to have different stocks of knowledge, experience and expectations upon which they draw in interpreting the world about them. Where does this knowledge come from? What happens when dramatically different stocks of knowledge meet in the classroom? What are the consequences for teachers and pupils of the way in which they see each other? In considering these questions examples can be drawn from all sections of the educational system. Material used pre-supposes an elementary grounding in sociology and it should be of great value to teachers and to all who are interested in understanding the effects which schools have on children.

The third course is entitled 'The Curriculum: Context, Design and Development'. It discusses the kinds of curricula that schools should provide and the related problems of implementation. In the first part there will be an examination of a wide range of ideas and practices in education with a view to discovering consistencies and inconsistencies. Next there will be a review of the principles involved in curriculum design and the problems of curriculum development. Finally there will be a survey of the various constraints on curriculum development and the forces which generate a change.

16.4 Second Level Courses

The full range of the second-level courses offered by the University is indicated below in a table taken from the 1972 prospectus of the Open University. (Courses marked with an asterisk will not be available in 1972.) It should be remembered in reading this table that to obtain a degree a minimum of six full credits is required, two of which should be at the foundation level and the remainder at the second, third and fourth levels. For an Honours degree eight credits are required, two of which should be at foundation level and the remainder at the second, third and fourth level. For full details people should consult the prospectus of the Open University which is obtainable from The Open University, Walton Hall, Bletchley, Buckinghamshire.

Line of Study	Number of Course	Title of Course	Credit Rating	Pre-requisite	Excluded Combination
Arts	A201	Renaissance and reformation	1		
	A202	The age of revolutions	1		
General	*AST281	Science and the rise of technology since 1800	½		
Social Sciences	D203	Decision making in Britain	1		
	D281	New trends in geography	½		
	D282	National income and economic policy	½		
	D283	The sociological perspective	½		
	*D202	Fundamentals of psychology	1		
	*D284	Prices and markets	½		
Educational Studies	E281	Personality growth and learning	½		
	E282	School and Society	½		
	E283	Environment and learning	½		
Mathematics	M201	Linear mathematics	1	M100	
	*M202	A further course in mathematics: title to be announced	1	M100	
Mathematics/ Science/ Technology	MST281	Elementary mathematics for science and technology	½		M100
	MST282	Mechanics and applied calculus	½	M100 or MST281	
Mathematics/ Social Sciences/ Educational Studies	*MDE 281	Statistics	½		
Science	S221	Comparative physiology and biochemistry	½	S100	S242
		OR			
	S223	Comparative physiology and environment	½	S100	S231
		OR			
	*S222	Comparative physiology, development and genetics	½	S100	

Line of Study	Number of Course	Title of Course	Credit Rating	Pre-requisite	Excluded combination
Science (contd)	S231	Geology and environment	½	S100	S223
		OR			
	S232	Geology and geochemistry	½	S100	S243
		OR			
	*S233	Geology and earth resources	½	S100	
		OR			
	S234	Geology and physics of the earth	½	S100 AND M100 or MST281	
	S241	Chemistry: bonding and structure	½	S100	
		OR			
	S242	Chemistry and biochemistry	½	S100	S221
		OR			
	S243	Chemistry and geochemistry	½	S100	S232
Science/ Social Sciences/ Technology	SDT286	Biological bases of behaviour	½	To be decided	
Science/ Technology	*ST281	Principles of chemical processes	½	S100 or T100	
	ST282	Electromagnetics and electronics	½	S100 or T100	
		OR			
	*ST283	Electromagnetics and physics applied to biology	½	S100 or T100	
	*ST284	Solid state physics	½	S100 or T100 AND M100 or MST281	
	ST285	Solids, liquids and gases	½	S100 or T100 AND M100 or MST281	
Technology	*T221	Microelectronics and computers	½	ST282	
	*T231	Applied mechanics	½	MST282	
	*T241	Systems and control	½	T100 AND M100 or MST281	
General	*TA282	Integrative studies 1: Design methods	½		

16.5 Postgraduate Courses

In addition to the undergraduate courses the Open University aims to provide opportunities in higher education at the postgraduate level for two types of student. The first would be the type of postgraduate found at most other universities - the graduate who is able to study for a higher degree by fulltime study. A limited number of places will be available for students to work at the University's headquarters at Milton Keynes. The second type of student will be the graduate with some years' experience in industry, education, civil service, local government or in research laboratories who wishes to read for a higher degree on a part-time basis in his own locality. Normally the entrance requirement would be an Honours degree of a British university. Applications will, however, be considered from other candidates who can satisfy the University that their qualifications, experience or ability are of an equivalent standing but such applicants may be required to take an examination or undergo some other form of assessment before registration. The University is not yet in a position to offer course work leading to higher degrees. In the initial years of a postgraduate programme therefore all higher degrees will be awarded for research work. Preference will be given to candidates who can demonstrate an understanding of the methodology and techniques required to undertake original research and who show evidence of research potential.

17. Scottish Education Department. Consultative Committee on the Curriculum, Second Report, 1968/71, published by HMSO, price 39p.

This is the second report of this Consultative Committee on the Curriculum for Scotland and describes the work being carried out in Scotland in all the subjects of the curriculum.

17.1 Mathematics

In particular, in mathematics it reports that a new Secondary Mathematics Committee was set up with the following remit:

> "To review and where necessary adapt the content of the existing alternative syllabuses for the use within a wide range of abilities in S1 and S2.
>
> "To devise a course in mathematics which is suitable for the needs of pupils who do not in the first instance propose to continue the study of mathematics beyond the ordinary grade of the Scottish Certificate of Education. The course would be primarily concerned with providing a general mathematics education but would be devised in such a way as to permit pupils who so wished to carry the subject further."

This Committee has progressed to a point where an experimental syllabus and related materials are being tried out at S1 level in about 25 secondary schools during the school year 1971/72.

17.2 Science

A Scottish Central Committee on Science was set up and held its first meeting on 1 April 1970. The remit of this Committee was to:

> "Have general oversight over all branches of science education and to initiate new developments in science education."

The Committee is responsible for the educational policies pursued by the Scottish Centre for Mathematics and Science inaugurated on 1 March 1971 and housed within the College of Education in Dundee. A number of main topics have

been considered by the Committee. These include: the functions of the Scottish Centre, the setting up of regional science development groups in collaboration with education authority science advisers/organisers, laboratory assistants and technicians, reviews of the courses leading to the Certificate of VIth year studies in physics and chemistry and the place of science in the school curriculum. As far as the Scottish Centre for Science and Mathematics is concerned, it has now prepared for publication a memoranda for teachers dealing with:

17.2.1 Symbols, formulae and nomenclature for use in the teaching of chemistry.

17.2.2 The new mathematics for teachers of science.

17.2.3 the depth of treatment suggested for the various branches of mathematics at VIth year level and an occasional bulletin is in preparation.

In addition to the Central Committee sub-committees on chemistry, physics and biology have been set up to deal with the specific problems of each subject. These committees have in turn formed working parties in collaboration with the Examination Board. These committees and working parties are in the process of producing recommendations about a number of topics. These include:

Specific objectives for the O and H grade syllabuses in physics and chemistry.

A teaching sequence for O and H grade biology.

A review of the syllabus, project work and examinations technique for Certificate of VIth year studies in Physics and Chemistry.

The symbols and nomenclature to be used in teaching physics.

The recruitment, employment and training of laboratory assistants and technicians.

Safety in the laboratory.

A review of the O and H Grade syllabuses in chemistry.

Other activities have included studies of the computer in relation to work in schools and studies on health science.

18. Schools Council Working Party on Dissemination

The first meeting of the Schools Council Working Party on Dissemination took place on 1 May 1972. This Working Party has been set up by the Schools Council to recommend more effective ways of making known to teachers the results of curriculum development projects. In October 1971 the Council decided to ask proposers of new projects to ensure that they budget for dissemination. The Working Party will consider how such dissemination by projects and by the Schools Council itself can be made most effective. The Schools Council is particularly concerned that the large number of projects ending over the next two years should reach the widest possible audience. The Working Party has been asked to report progress on what it sees as the most urgent need by the end of June 1972. When decisions have been taken by the Secretary of State for Education & Science on the James Report (see SEN 18:21) it is expected that the Working Party will be asked to consider what role the Schools Council might play at appropriate stages in the education of teachers about curriculum innovation. The Chairman

of the Working Party, Dr F Lincoln Ralphs, Chief Education Officer, Norfolk, sees the two main long-term problems as "How to improve the lines of communication between a project and grass-roots teachers during its life" and "How to provide care and oversight for a project's work after its members have dispersed". The terms of reference of the Working Party are "To consider the place of dissemination and in-service training in the work of the Schools Council with particular reference to curriculum projects financed and supported by the Schools Council, to make proposals to Programme Committees and to report progress to the June meeting of the Committee."

19. Schools Council Project Technology

From 1 September the work of Project Technology will be taken up and developed by a National Centre for School Technology which is to be set up and which will be based at Trent Polytechnic, Nottingham. This means that the future of the quarterly journal 'School Technology', formerly 'Bulletin', is now assured. 'School Technology' has developed into a nationwide forum for the exchange of ideas on how schools can make boys and girls aware of the technological forces in society and involve them in technology itself. The journal has the official encouragement of the Standing Conference on Schools Science & Technology (SCSST- See SEN 18:25). It should also be added that although the Schools Council cannot support the project financially from September, it has given its encouragement to the continuation of 'School Technology' and other Project Technology work. 'School Technology' appears four times during the academic year in September, December, March and June. The basic annual subscription is £1.50.

O.

PUBLICATIONS

20.1 Safeguards in the School Laboratory, Association for Science Education, price 15p.

This publication for the Association for Science Education by John Murray, London has been revised and reset. It is set out under the main headings of Precautions, which include fire, safety devices, glass under stress, compressed gasses, electricity radiation hazards, dangerous chemicals and storage; First Aid in school laboratories, and also contains a bibliography including books on laboratory management, dangerous chemicals, and Department of Education and Science memoranda.

20.2 Hazards in the Chemical Laboratory, edited by G D Muir, published by the Royal Institute of Chemistry, price £3.00 (softback £2.00)

This new volume published in September 1971 is a successor to the Royal Institute of Chemistry's Laboratory Handbook of Toxic Agents first published in 1960 and issued in a revised edition in 1966. Before the second edition went out of print the future publication was considered by both the Institute Publications Committee and by the previous editors Professor C H Gray and Dr Muir. It was generally felt that rather than merely revise the existing material it would be possible to alter the underlying philosophy of the book by changing its scope from toxic hazards to a consideration of all hazards likely to be encountered in the chemical laboratory. The general format remains the same with the major part of the book being an alphabetical guide to hazardous chemicals and measures to be taken in the event of accidents in their use. However whereas previous editions have included details of measures to be taken against the toxic hazards of such chemicals the present edition also includes methods for spillage disposal and extinguishing fires where appropriate. Once more an alphabetical listing is adopted to enable the use of the book as a speedy reference in the case of emergencies. The contents are as follows:

20.2.1 Introduction and general principles

20.2.2 Planning for Safety

20.2.3 Fire Protection

20.2.4 First Aid

20.2.5 Hazardous gasses, reagents and solvents

20.2.6 Safety in hospital biochemistry laboratories

20.2.7 Precautions against radiations

The book is obtainable from the Chemical Society Publication Sales Office, Blackhorse Road, Letchworth, Herts SG6 1HN.

20.3 Chemistry by Experiment and Understanding, by J R Gerrish and D H Mansfield, published by McGraw-Hill at £3.00

This book is intended to provide suitable material for 2 or 3 years as a chemistry course immediately prior to O level, a time-table allocation of 8-10 period-years having been assumed. The book is part of a secondary science series and the consulting editor in chemistry is Dr R C Whitfield of the University of Cambridge Faculty of Education. A deeper examination of the book will reveal that some topics such as electronic structure,

periodicity, complex ions, atomic energy and activation energy have been included and this may be regarded as somewhat unusual in a book for this level. However the treatment is lucid and as simple as is reasonable and consistent with a correct explanation of these factors. The use of the book does not depend on the student mastering all of these topics and it is possible for some of them to be treated in less depth if so required. A feature of the book is the integration of the practical and theoretical work and the application of chemistry to situations outside the laboratory is continually stressed. In common with many publications today, SI units are used exclusively and in general IUPAC nomenclature is used except for trivial names in common use. The diagrams and illustrations throughout the book are particularly well drawn and can easily be followed. The book is available in 2 editions, a pupil's book and an edition which is a teacher's handbook in addition and which contains some 60 additional pages of comment for the teacher on the material contained in the pupil's section of the book. This includes directions on the carrying out of various experiments as well as some additional comments on the theoretical content. This will be a particularly valuable guide to the less experienced teacher who is meeting some of this work for the first time in a teaching situation.

20.4 A New Practical Chemistry, by J S Clarke and S Clynes, published by The English Universities Press Ltd, price £0.75

This book helps to tackle the problem of planning a practical course over 5 years to GCE 'O' level on a limited budget. It contains a graded range of experiments designed to convey information and to give an insight into the modes of chemical investigation and there are techniques to cover the 5 years. It is assumed that at the start the practical period may not be accompanied by definite periods for discussion etc but that as the course proceeds one, and then two, periods will be available for discussions, doing calculations, seeing films and reading. The instructions are not linked to one particular theory book; it is assumed that in addition to having individual textbooks, students have access to a library containing many of the pamphlets recently published for the Nuffield course and to other books. The experiments in this book have also been produced on separate sheets at the same price. The sheets can be divided up and used throughout the school simultaneously. They have been punched, so that interleaved with file paper for results and commentaries they constitute a complete laboratory notebook, and it is hoped that this form of presentation will be found to be both practical and economical.

20.5 Physics Projects: a book of experiments, models and enquiries, by A D Bulman, published by John Murray, price £1.75

This is the third book from this author which has the aim of providing projects to bridge the gap between physics theory and application. This new book outlines projects that are rather more advanced than in previous books. They are ranged in order of increasing difficulty and include practical items like air pressure gauges and others, such as an electronic mouse complete with whiskers and squeak, which combine instruction with a sense of fun.

20.6 Looking at Life, Stage I and Stage II, J A Cameron, Nelson, price £0.30 each

These are the first two publications in a series of four books which will be accompanied by a teachers' guide. It aims to provide a new approach to environmental biology for primary schools which goes beyond

nature study by showing how living organisms react and interact and form part of the cycle of nature. In addition to the normal observational studies of plants and animals particular emphasis is laid upon such factors as plant habitats and animals in their context, with particular reference to dormancy, the life cycle of the frog and so on. The change of patterns of life with the seasons is a recurrent theme.

20.7 School Projects in Natural History, edited by the Devon Trust for Nature Conservation, published by Heinemann Educational Books London, price £2.00

This teacher and pupils guide contains 114 natural history subjects suitable for both individual and group use. The collection was made by the Devon Trust for Nature Conservation and the material is relevant to the study of flora and fauna throughout the United Kingdom. The projects are arranged in ten sections as follows:

A General Introductory Section
Mammals; Birds; Insects and Spiders; Snails and Slugs;
Trees, Woods and Hedgerows; Plants other than trees;
Ponds and Rivers; Seashores; Soil

Within each section the projects are grouped according to their suitability for different age groups from primary and middle school level to sixth forms in secondary schools. Many of the projects can however be easily adapted by the individual teacher to suit any particular age and ability group. Although the book is UK based many of the ideas of the projects could be adapted for use in other countries using local flora and fauna. This is an extremely useful source book of ideas for biology teachers.

20.8 Methuen Studies in Science

This series provides students with concise introductory surveys in important topics in the physical, chemical and biological sciences. The series is designed to assist sixth form students preparing for entry to university or college and to meet the needs of university students preparing for more advanced studies. The general editor of the series is Dr J M Gregory of Winchester College and the consultant editors are Dr B E Dawson of King's College, London and Dr R Gliddon of Clifton College Bristol. The following titles are available:

Alternating currents	price £0.80
Energy in chemistry	£0.80
The inorganic chemistry of non-metals	£0.80
Nature conservation	£0.90
Aspects of isomerism	£0.80
Atomic and molecular weight determination	£0.90
Enzymes	£0.80
Chemical equilibrium	£0.80
Logical control systems	£0.80
The mechanical properties of materials	£0.90

Further titles will be forthcoming later. In general the contents of the books are appropriate for students for Advanced and Scholarship levels in particular and go beyond the material contained in the average sixth form

text. They will thus form useful additional and supplementary readers for the good student wishing to follow his subject beyond the bounds of that which is strictly required by the syllabus. In London these books are published by Methuen Educational and in New York by Barnes & Noble.

20.9 Objective Testing: a guide for science teachers, by E W Jenkins, published by the Centre for Studies in Science Education, The University, Leeds, price 30p

Science curriculum reform over the past decade has been accompanied by important and long over-due modifications in the techniques of examining. Welcome though these changes may be they have involved the application of assessment procedures which few science teachers have had the opportunity to acquire. At the same time there are indications that science teachers are becoming increasingly involved in the task of assessing their pupils' learning. The setting of examination questions has never been a simple matter and with the increased use of objective test items demands on professional skill and expertise have risen sharply. With these developments in mind the Centre for Studies in Science Education has produced a brief manual on objective testing, intended for those science teachers who wish to understand the scope and limitations of objective questions and to construct satisfactory test items for their own use. The contents of the manual are divided into four parts with an additional section which gives suggestions for further reading. The four parts cover:

The nature of objective tests

Writing objective test items

Reviewing objective test items

Marking and statistics

Copies are available from the Centre for Studies in Science Education, The University, Leeds LS2 9JT, England.

20.10 Teaching Science in Australian Schools, by Kwong Lee Dow, published by Melbourne University Press, price £1.65

This book is tne first in a series under the general heading of the 'Second Century in Australian Education' and under the general editorship of R W Serreck. The book is an account of the state of learning and teaching in science in Australian schools at the start of the 70s. It attempts to describe recent changes to review trends and innovations and so to ask whether the goals of the educators are likely to be realised in the near future. The chapter headings are:

A Thing from Science?

Changes in Outlook

Newer Curriculum Projects

"Teaching Sciences and Enquiry"

Australian Science Courses

Shortages of Science Teachers

The Education of Science Teachers

20.11 Science Education in Africa, edited by P G S Gilbert and M N Lovegrove, published by Heinemann Educational Books Ltd, price £1.50

The Sixth Leverhulme Conference was held at Chancellor College, University of Malawi, Limbe, Malawi, from 25-30 March 1968. This report, now published under the title of 'Science Education in Africa', covers the proceedings of this Conference. The report is divided into six sections covering a general introduction to the problem, psychological and sociological considerations in respect of pupils, the curriculum, evaluation of science education, and two sections covering the Conference discussions on the earlier sections of the report and the findings of the Conference itself. The complete texts of the leading papers are included and amongst these of special note are those on "The attainment and abilities of African children: a broad survey" by Dr K Lovell of the University of Leeds; "Understanding of science: the impact of the African view of nature" by Dr T R Odhiambo of the University College, Nairobi; and "Aims of science teaching in emerging countries" by Professor L J Lewis, University of London. Although it has taken some time for this material to appear in published form, it nevertheless is a valuable addition to the literature on science education development in the African continent and it may well have considerable interest for workers in other developing countries.

20.12 Out of School Scientific and Technical Education, published by the International Co-ordinating Committee for the Presentation of Science and the Development of Out of School Scientific Activities (ICC), with the assistance of UNESCO. This new journal is published in four languages, English, French, Spanish and Arabic. The subscription rate for four issues is 20 francs, or $4.00 from ICC-2, Place St Lazare - 1030, Brussels, Belgium.

The promotion of public understanding of science and technology as well as the development of out of school scientific activities has undergone remarkable changes in recent years. This can be noted not only from the rapid improvement in these activities, but even from the comparison of past and present papers written on the subject. In the past the principal aim of many articles was to find as much evidence as possible pointing out the importance of the role which science plays in society and the necessity for its popularisation, but at present articles are much more devoted to a discussion of existing problems, to the exchange of ideas and information and to the description of recent developments and achievements. It is no longer necessary to repeat that science and technology have come to be an important part of modern culture and that no man can consider himself in the mainstream of modern thought if he remains a "scientific illiterate" is now a well-known fact. The change can be noted in the transformation of this particular journal which is published by the International Co-ordinating Committee for the Presentation of Science and the Development of Out of School Scientific Activities (ICC) with UNESCO assistance. Only a few years ago ICC had its Bulletin in an off-set form with a circulation of about 200. Last year the first printed issue of the ICC Bulletin appeared and at the present time the first issues of a full-size international pictorial magazine devoted to out of school science and technical education has appeared. The present issue contains articles on Scientific Literacy, a Youth Science Seminar on water pollution problems, the Public Understanding of Science, a European Symposium on the introduction of the public to science, a scientific lecture competition and articles of particular reference to developments in individual countries. In this latter context specific articles refer to India and Latin America and the ICC news section covers a much wider range of countries. This reconstructed journal will be a valuable addition to the media for exchange of information and ideas in this most important aspect of science and technical education.

20.13 Mathematics through School, edited by Geoffrey Matthews, published by John Murray, price £0.90

In the preface, Professor Matthews, who has been organiser of the Nuffield Mathematics Project since its inception in 1964 and who since 1969 has been Shell Professor of Mathematics Education at the Centre for Science Education, Chelsea College, London, states, "something dramatic has been happening to school mathematics and revolution is perhaps not too strong a word, but revolutions generate fog and the new maths is hard to pin down; it has been taken to mean anything from a catalogue of unfamiliar symbols to the vague notion of 'letting the children think'. This book is designed as a modest exercise in communication: it aims not only to give that long-suffering character 'the intelligent layman', a glimpse of the new spirit but also to show the embattled teachers themselves something of what is going on at other levels." The material is based on a series of lectures given at the Centre for Science Education during the winter of 1970/71. The papers are on mathematics from pre-school and infant level through to A-level. It gives information on secondary mathematics projects; school mathematics projects; mathematics in educational industry projects, etc. The last section is entitled 'Breaking down Barriers' and there are papers on computing, mathematics and biology, mathematics in sociology, mathematics and physical science.

✓20.14 Mathematics: The later primary years, a Nuffield/CEDO Handbook for Teachers, published by Chambers, Murray & Wiley, price £1.50

This is the second in a series of three Handbooks which is being produced by CEDO especially for teachers overseas. The work of the Nuffield Mathematics Project has aroused interest throughout the world and the teacher's guides for the Project have been well received, both in Britain and in other countries yet there is a need also for some shorter books presenting the material contained in the guides in a form and sequence which will enable teachers in developing countries more easily to obtain information on the Project's aims and methods. These three Handbooks are intended to do this. The first of the Handbooks, Mathematics: The first three years, considered the development of a child's awareness of mathematics during the pre-school years and during the first three years work in the primary school. This second book extends the work to cover roughly the fourth, fifth and sixth years of primary schooling. Emphasis on practical experience and guided discovery continues in order to establish sound understanding of the basic mathematical concepts on which future work can be built. Some teachers may finds these Handbooks sufficient to meet their needs; others will want to supplement them later on with the full teacher's guides. In either case the value of the books will be greatly increased if they are used in conjunction with pre-service and in-service teacher training courses.

20.15 New Thinking in School Geography, Department of Education & Science Education Pamphlet No.59, HM Stationery Office, price £0.68

Reform in geography teaching springs from two quite different though linked themes. First, there are those who are concerned that linking research, university teaching and school teaching should be strengthened. These are academic geographers whose devotion is naturally to the subject. Secondly, there are the educationists dedicated to curriculum reform who ask what is important to the society and the individual. This publication surveys the present situation in the rapidly changing patterns of geography teaching in schools in the United Kingdom. As in many other scientific and semi-scientific subjects, the boundaries of knowledge in the geographical field have extended enormously in the

last few decades and this has had a corresponding impact on the material to be taught. In political geography the patterns of world organisation change as independent states emerge from former colonial territories and as the patterns of exploitation of natural resources vary with new discoveries. The newer ideas on educational practice have also had their impact in the geography field and the growth of environmental studies at least partly reflects this thinking with younger children. The publication traces the patterns of change in geography teaching first of all with younger and then with older pupils; then looks at the field and classroom situations. An important section deals with geography and society and the greater strength of the modern links between geography, science and mathematics is given a special place. This latter section emphasises that the scientific method as applied in the traditional science subjects applies in many ways to research and study in geography as well. With the growth of the use of statistics and the link in the biological field between various factors bearing on ecological situations, the integration of geography with other studies is now much greater than it has ever been before and this is likely to increase still further. A final section deals with geography and the teacher and looks at the relationships between the real world and the various elements in geography, its models and theories and the systems which appear to emerge from its study.

20.16 Modern Meteorology and Climatology, T J Chandler, Nelson, price £1.05

This is an interesting new book which in addition to the more traditional studies of the atmosphere in terms of its measurement and the elucidation of its structure, goes on to discuss the atmosphere in motion and the various circulations associated with this, evaporation, condensation and precipitation and the principal weather types, depressions and anti-cyclones. It goes on to discuss patterns of climates throughout the world including those in tropical areas and the monsoons of South East Asia and West Africa. The influence of local climates on vegetation and environment receive some attention, as does the problem of climatic change and climatic control. The book concludes with a useful bibliography of current books on weather and climatology.

✓ 20.17 Teaching Environmental Studies in the Middle and Primary Schools, C J Lines and L H Bolwell, published by Ginn & Company Ltd, price £2.00

Many teachers are convinced of the value of environmental studies in primary and middle schools but others, though they recognise the value of methods which give children first hand experiences and opportunities to utilise their natural curiosity, are not fully confident of their own ability to plan and carry out such an approach. The book is based on work in environmental studies carried out by the authors during the last five years in a variety of schools where they constantly had to find practical solutions to the day-to-day problems which arose. The book is divided into four sections: Section 1 deals with the nature of environmental studies, the role of the teacher, the scientific and creative aspects of the approach and the contribution which children with informed opinions about their environment can make to its improvement and preservation. This Section also pays attention to environmental studies in relation to immigrant children and children with particular learning difficulties and its future in the primary and middle school curricula. Section 2 discusses the introduction of environmental studies into the school curriculum, assessing the value of differences in these, the organisation of a study, evaluation of children's progress and difficult environments. Section 3 sets out a number of case studies carried out in schools. Section 4 suggests ways in which teachers can extend and develop their own knowledge and techniques.

Sources of information and services offered by organisations concerned with the environment are also included. In many ways the book is a companion volume to the series called 'Discovering your Environment' also published by Ginn & Company Ltd, which is a series of books designed for use by children between the ages 8 and 13 years. The titles in this series are: Understanding local maps, Using local maps, About the weather, About buildings and scenery, People at work, People on the move, History in a village, History in towns, History along roads and waterways, Crafts and industries in the past.

✓20.18 Aspects of Educational Technology V, the Proceedings of the Fifth Conference of the Association for Programmed Learning in Educational Technology held at the University of Newcastle upon Tyne, 31 March - 3 April 1971. Pitman Publishing, price £4.50

This is the fifth in a series of publications following the annual conferences of APLET and as summaries of work in progress they are valuable reference texts as well as providing detailed information on the most recent developments in this field. Of particular interest to scientists in this volume are articles on 'Self-Teaching Systems' in university courses, P J Hills, University of Surrey; the symposium on the Open University, and 'Some uses of Mathematics in Micro-Teaching in Teacher Training' by R J Britain and G O M Leith, amongst others.

✓20.19 Schools Council Working Paper 42: Education in the Middle Years, published by Evans & Methuen Educational, price £0.70

This is the first report from the Schools Council Middle Years of Schooling Project, Department of Educational Research, University of Lancaster. The Project's terms of reference are for a consideration of "the whole curriculum" for children between the ages of 8 and 13 and the project's mode of procedure has necessarily been different from that used by projects which are given a defined subject area and then asked to produce learning materials. The project is in the think-tank rather than the materials producing category. Time, effort and thought have therefore been given to the principles of curriculum construction and the work has had to be begun at a level prior to that at which the decision to provoke learning of a particular kind and particular subject area is taken.

The project does not have trial or pilot schools but has devised two methods of carrying out field work which have proved to be most valuable. Firstly, with the aid of a large number of experienced informants and a carefully drawn up specification, it has been possible to identify visits and observe schools where classroom practice was held to be good of its kind. These visits are still continuing and the results are helping to shape the views expressed in this and following publications. Secondly, hundreds of teachers in teachers centres agreed to form discussion groups to assist the project and the results of their deliberations are reported in this working paper. The report is given under six headings:

The Middle Years of Schooling

Aims and objectives

Children in the middle years of schooling

The curriculum

Patterns of organisation

Reviews of teachers

There are three appendices:

Project discussion papers for local working parties

Table of working party conclusions

Working parties which submitted reports

21. SCIENCE EDUCATION ABSTRACTS

21.1 An Individualised Course for Learning Chemistry, Dr C Reynolds, Education in Chemistry, May 1972, Volume 9, No.3, page 90.

What is the ideal way to learn chemistry - surely this is the question that all teachers would like to be able to answer. Dr Reynolds has analysed some of the important issues involved and he believes that by his individualised learning scheme his students are efficiently gaining a mature understanding of the subject. Dr Reynolds points out that with students learning the subject step by step in sections, although he can appreciate how an item is related to what has gone before, he cannot conceive relationships with what is to come. Thus one overall aim of a course of chemistry should be to overcome the difficulty that the teacher and student perceive the subject quite differently. He proposes two procedures which could help to overcome this: first, if the whole course has an overall structure at the start which is appreciated by the student and secondly, as far as possible there should be a constant basis to the subject from which the various sections can be derived. He suggests that in chemistry we have a ready-made basis for this in the behaviour of atoms and molecules. The article goes on to describe a possible structure of a course based on these premises and experiences which the author has had so far with this course at Standbridge Earls School, Romsey, Hants. In the first full year of the scheme 35 boys took part and some preliminary evaluation has been attempted.

Education in Chemistry is published by the Royal Institute of Chemistry and the Chemical Society in January and alternate months each year. The subscription rate is £5.00 per annum, single copies £1.25 and enquiries regarding subscriptions should be addressed to Chemical Society Publications, Sales Office, Blackhorse Road, Letchworth, Herts SG6 1HN, England.

21.2 Research in chemical education: reassessment, by R C Whitfield, Chemical Society Reviews, Vol.1, No.1, 1972, p.27.

The thesis of the author of this article is that "research" into chemical education implies detailed dispassionate enquiry into any aspect of the teaching and learning of chemistry at any stage in education. Some of this enquiry, perhaps more than we realise, can be done by disciplined "armchair" methods, but much can only be performed by some kind of deliberate, imaginative, yet controlled, empirical investigation; implied is much more than mere fact-finding or opinion gathering surveys. The author deliberately excludes the administration of chemical education and development in chemical education, meaning the production of new courses and other less extensive innovations together with their related aids and apparatus from his definition of research. The article goes on to attempt to provide a new perspective on chemical education and to discuss current research and growth points. An interesting diagram entitled 'The anatomy of chemical education' is produced with major headings then described in some detail. These headings include 'The assessment of chemical ability', 'The assessment of courses (Curriculum evaluation)', 'Content analysis', 'Method variables', 'Students' perception', 'Chemistry and other subjects', and 'The training of chemistry teachers'. Attention is paid to the existing gaps in our understanding and the barriers to effective research. As an over-view of what is often regarded as a very complicated field of study this review adds considerably to the literature on this subject so far available.

Chemical Society Reviews is an amalgamation of two previous review periodicals, the Chemical Society Quarterly Reviews and Royal Institute of Chemistry Reviews. The first publication of the new series, Chemical Society Reviews, appeared in April 1972. Members of the Chemical Society may subscribe to Chemical Society Reviews at £2.00 per annum. Non-members may order Chemical

Society Reviews price £8.00 per annum from the Publications Sales Officer, The Chemical Society, Blackhorse Road, Letchworth, Herts SG6 1HN, England. Chemical Society Reviews will appear quarterly and should comprise approximately 25 articles per annum. Most of the reviews are concerned with chemistry matters rather than chemical education.

21.3 Evaluation Studies of the Nuffield A level Biology Trials: 2. Evaluation of specific objectives, P J Kelly, Journal of Biological Education, Volume 6, No.1, February 1972, page 29.

The first article in this series (see SEN 18, 29:4) dealt with a student's overall achievements. The second article is concerned with the achievement of two groups of more specific objectives set out for the Nuffield A level biology scheme: those which describe particular aspects of student achievement and those describing characteristics of the course. The article begins by describing the assumptions made regarding the abilities required to comprehend and study biology at VIth form level. These are listed as:

21.3.1 acquiring information, terminology and conventions related to the study of living systems;

21.3.2 classifying biological data and synthesising them into generalisations and principles;

21.3.3 making relevant observations and asking relevant questions about them;

21.3.4 handling quantitative information and assessing the error and degree of significance involved;

21.3.5 assessing critically hypothetical statements with regard to their origin and application;

21.3.6 evaluating the implications of biological knowledge of the human society;

21.3.7 analysing observations and/or acquired biological knowledge and utilising them for identifying and solving problems with unfamiliar materials;

21.3.8 making creative contributions to investigatory and problem-solving studies;

21.3.9 recording and communicating adequately and relevantly both verbally and in writing.

These are related to the course objectives which are described in the second part of the article. The methods of assessment used indicate that the achievement of the objectives was assessed predominantly by analyses of ratings and comments by trial teachers and of items included in the examinations. Feedback from the teachers commenting on specific difficulties in the work and suggesting improvements was obtained after each chapter of the course. Ratings of achievement of objectives were obtained in the first, third and sixth terms. A comparison was made of the teachers' appraisal of objectives at the beginning and end of the trials. An interesting contrast arises here in that whereas the variation in the teachers' opinions over the two years about the desirability of the objectives was not very large, the variation in their estimate of the achievibility as against the actual achievement two years later was very high in some cases, which indicates that the ideals of the teachers were not altered to any appreciable extent and this suggests that their opinions about achievement were valid interpretations of what happened in the trials and not merely

reflections of changes to attitude towards objectives. Two further sections then analyse the achievement of student objectives and the achievement of course objectives. The results of these are then looked at in the light of the materials and circumstances under which the course was taught. Some comments on revision, the process of evaluation and the role of the teacher complete the article.

The Journal of Biological Education is published six times a year for the Institute of Biology by Academic Press Incorporated (London) Ltd, subscription rates for overseas $10 plus $1.10 postage. Subscription orders may be placed with Academic Press Incorporated (London) Ltd. 24-28 Oval Road, London NW1 7DX, with the exception of those originating in the USA, Canada. Central America and South America which may be sent to Academic Press Incorporated, 111 Fifth Avenue, New York, NY 10003, USA.

21.4 Metrication in the School Curriculum, by Edith Biggs, Trends in Education No.26, April 1972. (See also SEN 19:15)

Metrication in industry and commerce becomes fully effective in Britain in 1975; this article reviews the problems which the change to a fully metric system has raised in the school curriculum in England and Wales. Miss Biggs deals with the problems of standard units suitable for use with young children and the problems of area and volume in metric measure. She also outlines some of the inconsistencies present in the use of metric and decimal systems together with the continued use of fractions in some cases where it would perhaps be more logical to continue with the decimal system. In the secondary school the problem would appear to be a lesser one since Imperial and metric units have been in use for many years in science and mathematics at this level. In physical education athletes have now become accustomed to running lengths measured in metres instead of yards. With the full introduction of the SI system of units, however, subjects like geography and metal and woodcraft will also have to change to the metric system and the introduction of the degree Celsius will confuse people for some time until one naturally thinks in this system. Miss Biggs makes a plea that publishers should use only the metric units in new books because it is important that children should begin to think clearly in the new system right from the beginning and not have to practise conversions.

Trends in Education is published by the Department of Education & Science, Curzon Street, London W1, England. Copies may be purchased through HMSO price 18½p net. The annual subscription for four quarterly issues is 84p including postage.

21.5 Broadening the base: 1. Hugh Warren. Broadening the base: 2. Donald Hutchings, Education and Training, Volume 14, No.5, May 1972.

In these articles the authors explore the problems of the impact on technical education of the present debate on the appropriate synthesis to be achieved between science and technology in society and in the second of these Donald Hutchings comments that the single Honours degree aims at producing specialists yet most industrial companies need more broadly educated graduates. It is possible that the newly developed polytechnics in the United Kingdom could take the lead in pioneering interdisciplinary courses. Some universities are already exploring the integrated science degree and attempts in this direction are at present under study in the Universities of Stirling and the University of Aston in Birmingham. The CNAA degree courses being set up with the polytechnics in the UK have shown a marked interest in interdisciplinary studies. In general there is a combination of science together with business studies, industrial management and allied subjects but even wider combinations with history of science and philosophy also exist. The author points out that the very newness of the situation in respect of CNAA degrees and the polytechnics gives a unique opportunity to develop a very flexible

range of such interdisciplinary degrees. The same issue of the journal contains a select list of CNAA interdisciplinary degrees.

Education and Training is published by Macmillan Journals Ltd, 4 Little Essex Street, London WC2R 3LF. The overseas annual subscription is £4.75 (USA, Canada $13.00).

21.6 The changing scene of examinations at A level, R W Fairbrother, Physics Education, Volume 7, No.4, May 1972, page 203.

The author starts from the very reasonable position that some form of assessment of students is necessary and some form of evaluation of what teachers are trying to do with students is imperative. He thinks that it is as foolish to argue that examinations are free from defects as it is foolish to argue that because of these defects they should be abolished. The article attempts to analyse how advanced level physics examinations are changing and by looking at the nature of the change it tries to extrapolate into the future. One of the previous problems in this field has been that the position in respect of examinations remained static for many years. Questions many years apart were often very similar in nature and required no new thinking on the part of the teacher. More typical of present day situations, however, are the revised examinations following the introduction of such courses as the Nuffield Physics Project at O and A levels. Instead of the old pattern of perhaps six questions from 12 in three hours forming the basis of the examination, the situation now contains papers in which 40 compulsory questions have to be completed in one hour using coded answers, a selection of short answer questions, long answers, a comprehension paper, a practical paper and some sort of investigation. The article describes some of the questions which one can expect to find in various sections of examinations cast in this newer mould. While it is difficult to predict what will happen in the future, it seems probable that as the range of pupils in sixth forms changes and their interests broaden there may well be several types of physics examinations at this level. Certainly flexibility and variety seem to be the keynote for the trends in modern examination developments. The article concludes with a section on uncertainty and reliability in examinations.

Physics Education is published bi-monthly by the Institute of Physics, 47 Belgrave Square, London SW1X 8QX, England. The subscription rate for all countries except the USA, Canada and Mexico is £7.00 per annum; orders should be sent to Physics Trust Publications, Blackhorse Road, Letchworth, Herts SG6 1HN, England. Orders for North American countries should be sent to the American Institute of Physics, 335 East 45th Street, New York, NY 10017, USA.

21.7 Scientific Information

21.7.1 British Council Science Information Service

Scientists who are unable to obtain access to full references, or who wish to obtain information on further recent papers in their speciality of which they may be unaware, may use the free Information Service offered by the Science Library of the British Council in London. Photocopies from the National Lending Library can be supplied only if detailed and accurate references are given to the papers required.

Enquiries may be made direct to your local British Council Office or Library or to Science Librarian (NLL Scheme), The British Council, 59 New Oxford Street, London WC1A 1BP, England.

21.7.2 National Lending Library Photocopying Service (Outside Europe)

The National Lending Library for Science & Technology which now collects more than 35,000 periodicals has one of the largest collections of scientific

literature in the world. It covers the whole field of science and technology, including agriculture. Access to these holdings is available throughout the world by means of the NLL Overseas Photocopying Service. If the document is available the copy will normally be despatched within 36 hours of receiving the request. Items are sent out by airmail wherever possible. Payment is made by means of prepaid coupons which cost £0.42½. Each coupon entitles the use to one of the following:

Up to 10 pages of Xerox copy
Up to 10 pages of microfiche enlargement
Up to 20 pages of 35mm microfilm
One report on microfiche

Books of coupons and further information may be obtained through your local British Council office or Library, or direct from The Director, (Overseas Photocopy Service), National Lending Library for Science & Technology, Boston Spa, Yorkshire, Great Britain.

OVERSEAS ACTIVITIES

22 TEACHERS' VACATION COURSES OVERSEAS 1972

The following teachers' vacation courses, sponsored by the Overseas Development Administration, and administered by the British Council, are planned for science and mathematics during the period of July to August 1972 (mid-May to mid-June for India). Local tutors will be assisted by British teams.

Only the science and mathematics contents of the courses have been extracted.

Country	Subject and Level
Ceylon	Mathematics, Advanced Level - Secondary Science - Junior Secondary Physics & Chemistry - Writing materials for secondary schools
Gambia	Science - Primary
Guyana	Mathematics - Secondary Chemistry) Physics) - Secondary Biology)
India	Chemistry - Pre-University (Advanced) Biology - " " " Physics - " " " Mathematics " " "
Indonesia	Mathematics - Secondary
Jamaica	Physics) Chemistry) - Secondary Biology)
Kenya	Mathematics - Secondary (Ordinary & Advanced level) Physics) Chemistry) - Secondary Biology)
Lesotho	Mathematics and Science - Primary
West Malaysia	Nuffield Physics, Biology, Chemistry - Secondary (Upper) Mathematics - Secondary (Lower & Upper)
Malta	General Science - Secondary Mathematics - Primary
Mauritius	Mathematics - Secondary Science - Primary & Secondary
Montserrat	Science - Primary
Seychelles	Science - Secondary
Sierra Leone	Science - Secondary
Swaziland	Science and Mathematics - Primary

23. BRITISH HONDURAS

Belize Science Teachers' Association

The Belize Science Teachers' Association came into being again at the beginning of 1972. It was agreed to revive this Association which had lapsed for a while because it was realised that an Association of Science Teachers could do a great deal in helping teachers in their professional job. By May of this year the Association had produced four newsletters for its members; in June 1972 the Association will hold a science fair, the purpose of which is to publicise the activities of the Association, to raise funds for the purchase of equipment for loan to primary and secondary schools in the country and to provide students with the opportunity to pursue interests beyond the subject syllabuses.

Further information on the activities of the Association can be obtained from the Secretary, Belize Science Teachers' Association, PO Box 543, Belize City, British Honduras.

24. ISRAEL

During the last ten years Israel has been developing school science curricula and one of the main problems has been the provision of apparatus for pupils' use, within a budget which is limited, particularly as to imports. The problem has been partly solved by the establishment of a small factory, Banetiv Science Teaching Aids managed by Mr Chaim Korati, at Kibbutz Kfar Ruppin. About 15 people (1972) work in the factory, which makes apparatus of local design, using timber and simple engineering techniques for metals and modern materials. Most of the apparatus has been developed for use in Israeli courses such as the Rehovot high school physics course, written at the Science Teaching Department, Weizmann Institute for Science, Rehovot, but there is some overlap with PSSC, IPS, PS.II and Nuffield courses. Designs are kept simple and wherever possible use components which are easily available, and expensive commercial finish is avoided.

Apart from being a source of equipment (sales are handled by OR and Kol, Ibn Gvirol 40, Tel Aviv) the development and organisation of the factory, which could be studied during a short working visit, may be of interest to English-speaking people who are thinking about setting up something similar.

25. NIGERIA

The Science Teachers' Association of Nigeria has now produced its third Curriculum Development Newsletter. This volume contains the details of a biology syllabus to form a course for forms 3, 4 and 5 of the Nigerian secondary school.

In year 3, the content falls into four large areas - agriculture, methods and practice; ecological studies and principles; cell structure and types; and man and microbes, including public health.

In year 4 the student investigates further cell metabolism, structure and physiology of living systems, and problems of a. succession and b. over-population and over-crowding in a community.

In year 5 the processes of continuity of life-methods and means, variation in organisms, adaptation, and control of hereditable characters in organisms are dealt with. Copies of the Curriculum Development Newsletter may be obtained from the Rev P S Samual, General Secretary, Science Teachers' Association of Nigeria, International School, The University of Ibadan, Ibadan, Nigeria.

26. TANZANIA

The Ninth Symposium of the East African Academy will be held from 20-23 September 1972 at the University of Dar es Salaam to discuss the topic 'Science Education in East Africa'. The preliminary papers for the symposium pose the questions:

"Is there enough awareness of the importance of science education in East Africa?"

"Does the present science curriculum efficiently cater for the developmental needs of the East African countries?"

"What do we need to do to improve the teaching of science in East Africa?"

The following themes have been defined:

Relevance in content and direction of science syllabuses at different levels.

Manpower development.

Socio-economic implications and problems of science education.

The problem of providing relevant text-books.

The medium of instruction - the Swahili alternative.

Evaluation of teaching methods.

Full details can be obtained from Symposium Organising Committee, East African Academy, Tanzania Branch, PO Box 35033, Dar es Salaam, Tanzania.

27. THAILAND

Institute for the Promotion of Teaching Science and Technology (See SEN 18:38)

The Institute has been established with the support of the UN Development Project Special Fund to assist the Government of Thailand in modernising the teaching of mathematics and science.

The main phase of the Institute's mathematics programme was launched at a two-week Seminar which took place in Bangkok in May 1972. About 160 of Thailand's leading mathematics educators participated. They represented primary and secondary schools, colleges of education, universities and the Ministry of Education.

A link for mathematics has been established between the Institute and the Chelsea Centre for Science Education of the University of London. The team of five Consultants to the Seminar were led by Professor Geoffrey Matthews, Professor of Mathematical Education at Chelsea. Other consultants included Professor Howard Fehr of Teachers' College, Columbia, USA and Mr Bryan Wilson of CEDO.

The Seminar attempted to survey recent developments in the teaching of mathematics at all levels from lower primary to first year university. In the initial stages the Institute's main developmental work in maths will be at the upper secondary level. It will be led by a small design team, several members of which spent part of the Michaelmas Term 1971 at the Chelsea Centre for Science Education, where they worked with the staff of the Mathematics Department.

28. UGANDA

The Chemical Society of the Royal Institute of Chemistry, East Africa sectio will be holding its annual conference from Wednesday 20 September to Saturday 23 September 1972. This will be held at the Chemistry Department, Makerere Unive sity, Kampala. Meetings for four sections will be arranged during the conference Section 1 - Insecticides and insect pheromones; Section 2 - The surface chemistry of solids; Section 3 - Applications of instrumental methods in chemistry (gas chromatography, IR, UV and NMR atomic absorption spectroscopy; Section 4 - HSC Teachers' workshop. In the HSC workshop various contributors are going to set up pieces of apparatus and teaching aids assembled from simple, cheap and readily available materials with instructions how to build and use them. It is intended that teachers will make copies of these and take them away with them.

During the conference the annual general meeting of the RIC Section will also be held. A new Constitution for an East Africa Section on the Chemical Society (incorporating RIC membership) will be considered at the meeting.

Further details of the conference can be obtained from the Secretary, Dr A J Dandy FRIC, Makerere University, Kampala, PO Box 7062, Kampala, Uganda.

INTERNATIONAL ACTIVITIES

29. International Conference on the Educational Use of Living Material (SEN 17:4)

This International Conference was held from 17-20 April 1972 at the Centre for Science Education, Chelsea College, London. It was organised jointly by the Institute of Biology and the Schools Council Project Educational Use of Living Organisms in conjunction with UNESCO, the British Council and the Centre for Science Education. Approximately 150 people attended the Conference and the countries represented were Switzerland, Brazil, Israel, Kenya, USA, The Netherlands, Iceland, Denmark, Spain, West Germany, Canada and Sweden. Papers were presented to the Conference under the following general headings:

1. Supply and Conservation

2. Use of Resources

3. Techniques of Maintenance and Use

4. Legal and Ethical aspects

5. Use of Living Material in modern Biology courses.

The proceedings of the Conference will be published and further information can be obtained from Mr J.D Wray, Centre for Science Education, Chelsea College, Bridges Place, London SW6.

30. South-East Asia Regional Science Teachers' Associations' Conference, Singapore

30.1 This Conference was sponsored by UNESCO in co-operation with the Singapore National Academy for Science and the Science Teachers' Association of Singapore. It took place from 12-17 June at the Premier Hotel, Singapore. Thirteen delegates represented the Science Association of India, Hong Kong, Indonesia, Malaysia, The Philippines, Singapore and Thailand. UNESCO, Paris, were represented by Mrs Sheila Haggis of the Division of Science Teaching, together with other United Nations personnel from Australia, New Zealand, Britain and the USA. The meeting was a direct outcome of a recommendation made in Manila in 1970 at a UNESCO workshop on Integrated Science Teaching.

30.2 Each of the participating Associations presented a report on its objectives and activities to the Conference. Four major general objectives were put forward:

30.2.1 To promote the advancement of science education.

30.2.2 To stimulate public understanding of the role and importance of science.

30.2.3 To provide opportunities for teachers to communicate on science education matters.

30.2.4 To promote the professional development of science teachers.

30.3 In addition a number of more specific objectives were outlined, amongst which were:

30.3.1 To promote the active participation of students in the learning of science.

30.3.2 To promote the introduction and distribution of literature suitable for science students and teachers.

30.3.3 To participate in science curriculum research and development.

30.3.4 To encourage the establishment of science teaching centres and to participate in their activities.

30.3.5 To promote, organise and participate in courses in science education for teachers.

30.3.6 To assist actively in the improvement, design and management of school laboratories.

30.4 All the Associations present expressed a wish to establish more contact with other countries. National Associations were felt to have a valuable role to play in the moves towards integrated science in the countries represented, the rapid growth of technology and the increasing need for equipment, particularly in the development of new curricula which may need new types of examinations. Exchange of information between countries on these has become a matter of such importance that the meeting felt that a regional clearing house might be established for this purpose. A further suggestion was that of the creation of an International Federation of Science Teachers' Associations. An International meeting will be held with the purpose of forming such an International Federation of Science Teachers' Associations on 13-14 April 1973 at the University of Maryland, USA following the Conference on Education for Teachers of Integrated Science which is being organised by the ICSU Committee on the Teaching of Science with the assistance of UNESCO.

31. UNESCO/UNICEF/CEDO Asian Expert Seminar on the Development of Science/Mathematics Concepts in Children

This two-week Seminar was held at the UNESCO Asian Regional Headquarters for Education in Bangkok in May-June 1972. Its aims were to share knowledge of work that has been carried out in the field of concept formation in mathematics and science in young children in the age range three - eleven/twelve years of age, both in Asia and elsewhere, and to facilitate the development of new research in this field, particularly in countries in the Asian region.

Each participating country was invited to send two delegates, one of whom was mainly concerned with research in the field of children's concept development and the other with curriculum innovation in mathematics and science at primary school level. Countries represented were Burma, India, Republic of Korea, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka and Thailand. In addition, observers were present from Australia, Hong Kong and the Regional Centre for Science and Mathematics (RECSAM), Penang.

The two Consultants to the Seminar were Miss Joan Bliss of the Chelsea Centre for Science Education of the University of London and Mr Bryan Wilson of CEDO.

A systematic exposition of work in the field of concept formation in children already carried out in Europe and North America was given by the consultants, together with illustrative examples of related research projects undertaken in a number of African and Asian countries. Country representatives presented reports of work in progress, or projected, in their own countries. Time was devoted to practical investigatory work with children using the interview techniques developed by the Piagetian School. A number of research projects were drafted and discussed. It is hoped that these projects can be carried out in individual countries in the Asian region and that experience gained can be freely exchanged. Throughout the Seminar there was emphasis on the need for effective curriculum development in maths and science at primary level to be based on educational research conducted in the social environment concerned. At the same time the need was stressed for the results of research to be made readily available to, and to be used by, those responsible for such curriculum development work.

The official report of the Seminar will be published in due course by the UNESCO Regional Office for Education in Asia. It will include the principal conclusions and recommendations of the Seminar, with proposals for follow-up activities both at national and regional levels. The report will be available from UNESCO Division of Science Teaching, Place de Fontenoy, 75 Paris 7e.

32. GUINNESS AWARDS FOR SCIENCE & MATHEMATICS TEACHERS OVERSEAS: 1971/72

The awards under this scheme for 1971/72 were announced at the annual presentation of awards meeting at the headquarters of Arthur Guinness & Company Ltd, Park Royal Brewery, London, on Thursday 22 June 1972. In the overseas section, two prizes were awarded.

The first award of £75 for his entry "Saturation vapour pressure and refrigeration - an approach through experiment" went to Mr C A Bunker of Mbarara High School, Uganda.

A special award of £15 for his entry "The use of libraries and museums in school education" went to Mr M S Kanaganathan, King Edward VIIth School, Taiping, Perak, Malaysia.

Only two awards were made in this section for 1971/72.

During the ceremony considerable praise and gratitude was expressed to the three retiring judges who have served the scheme for the past nine years. They are Professor L J Lewis of the Department of Education in Tropical Areas of the Institute of Education, University of London; Mr J Wilson, of the same Department, and Mr H J Savory of the Department of Education, University of Bristol.

33. GUINNESS AWARDS FOR SCIENCE & MATHEMATICS TEACHERS OVERSEAS: 1972/73

It is proposed in 1972 and 1973 to make the Guinness Awards Scheme applicable to the following countries:

Nigeria, Ghana, Guyana, Sierra Leone, Kenya, Hong Kong, Malawi, Uganda, Tanzania, Singapore, Zambia, Ethiopia, Sudan, Lesotho, Botswana & Swaziland, Malaysia, Malta, British Honduras and the West Indian Islands.

Full details are given below of the arrangements for the 1972/73 competitions.

33.1 The purpose of these awards is to encourage teachers in schools and colleges overseas in the development of their teaching of science and mathematics, especially having regard to local needs and conditions.

Awards will be made on the basis of reports submitted to the Judges relating to the following aspects of science and mathematics education: the development of curricula and syllabuses; the design and production of teaching materials to meet special needs; investigation of the learning process in relation to study and teaching, the planning, equipment, provision and use of laboratory facilities, including resourceful solutions to meeting needs in circumstances of limited facilities; a science exhibition contribution; paragraph 6 of this paper is especially relevant to entries.

33.2 Awards will be to the value of £100, £50, £25 or £10 according to the decision of the Judges. For this purpose, a sum of £350 will be available annually. The right is reserved to refrain from awarding prizes of the maximum value if the Judges advise that no candidate has submitted an entry worthy of the award. In the event of no prize of £100 being awarded the prize money may be divided in whatever manner appears equable in the light of the Judges' recommendations. The decisions of the Judges will be final, and no correspondence will be entered into concerning their decision.

33.3 The Judges for the year 1972-73 will be:

Mr D G Chisman	Deputy Director of the Curriculum Division, Centre for Educational Development Overseas, and Secretary of the Committee on Science Teaching of the International Council of Scientific Unions.
Dr G Howell	Head of the Science Education Section, The British Council.
Dr J Maraj	Director of the Education Division, Commonwealth Secretariat.

33.4 Entries are invited from teachers (whether graduates or non-graduates) in the following categories:

33.4.1 Teachers in primary schools.

33.4.2 Teachers in secondary schools who have not by the date of entry completed five years' service.

33.4.3 Teachers in secondary schools who have by the date of entry completed five or more years' service.

33.4.4 Teachers in colleges of further or higher education of all kinds.

Entries may be submitted by either individuals or syndicates (eg the science staff of a school or college, or a partnership of teachers from more than one institution). In judging, no distinction will be made between the two types of entry.

33.5 The Topics - an entry may be on any topic which falls within the general field of reference given in paragraph 1. Entrants may, however, find the following list of possible topics helpful:

Report of a prizewinning contribution to a science exhibition. (The material submitted must show some originality and/or ingenuity in presentation and its authenticity be certified by the organisers of the exhibition.) The report, which may be supported by photographs or drawings, must provide sufficient information for a person reading the report to be able to replicate the contribution. (Actual equipment or materials used should not be submitted.)

The place of teacher-demonstration in science teaching.

The organisation of individual and group practical work in a selected area of the science course.

Schemes to develop pupils' mathematical concepts of problem solving.

An example of children's activity at primary or secondary level showing the integration of mathematics and other curricular subjects.

The design and equipment of a 'mathematics laboratory' at secondary level.

Concept difficulties of children of the area learning science.

The use of text-books and reference books in a five-year secondary school science course.

How to spend £1,000 in apparatus for a newly-furnished (physics, chemistry, biology, general science, advanced science) laboratory.

How to teach science with a limited amount of laboratory equipment and space.

How best to equip a science laboratory in specific circumstances given a specified limited sum of money.

The teaching of a specific aspect of science (physics, chemistry, biology or mathematics) at ordinary or advanced level.

Training a laboratory assistant.

Laying the foundations of science education in a primary school.

A teaching programme in science or mathematics for the whole or part of a school course.

The integration of separate science subjects in the last three years of an O level course.

Field studies in chemistry, or physics, or biology or elementary science.

A detailed ecological study of a given area.

The place of science in the local home today.

Activities of school science clubs.

Suggestions for the assessment of practical work in either a. GCE or b. other locally recognised examination.

An in-service training programme for experienced non-graduate teachers with limited science training.

Local adaptation of Nuffield, Scottish or other curriculum development project.

The design of a Science Teachers' Centre.

A teaching/learning programme integrating science with other curriculur studies.

The use of modern teaching aids in science or mathematics.

The use of libraries, museums, etc in science education.

It is intended that, whichever the topic of the entry, it should be based on personal experience and should include a substantial account of teaching and/or other education work actually carried out on the suggested lines.

33.6 Treatment of the selected topics:

33.6.1 The Judges will be glad to consider any reasonable treatment of the selected topic provided it is based on personal, or team, experience and it includes a substantial account of teaching and/or education work actually carried out relevant to the topic. The Guinness Award scheme is intended to reward original teaching carried out for long enough to enable a reasonable assessment of it to be made. Entries which are only suggested schemes, new programmes, or revised syllabuses which have not been tried out will not be considered. Judges may return an entry for submission at a later date if it shows promise but has been submitted prematurely.

33.6.2 The following may be of help to any who are uncertain about making an entry, but it is not suggested that this is the only form of submission:

An account should be given of:

33.6.2.1 the background to the work;

33.6.2.2 the particular difficulties or problems which were to be solved, or other reasons for the work;

33.6.2.3 the thinking (principle) on which action was based;

33.6.2.4 what action was taken and how it was carried out;

33.6.2.5 reactions and results;

33.6.2.6 further action to be taken or rethinking.

33.7 Application for Registration must be made before the date given in paragraph 33.9. Intending applicants should therefore apply early for registration forms to: Science Education Section, The British Council, 59 New Oxford Street, London WC1A 1BP.

33.8 Presentation of Entry

Only one entry can be accepted from any one entrant or syndicate.

The entry must be written or typed on one side of quarto sheets of paper. Reports should not exceed 10,000 words in length and normally might be expected to be of the order of 2,000 - 5,000 words.

Photographs and other illustrative material should be included wherever relevant, together with any other evidence that shows the ideas have been effective in practice. Such evidence may include the work of pupils.

Reference should be made to the source of information or of original experiments wherever this is necessary to a proper assessment of the proposed modifications. If any substantial part of an entry is being published or submitted as a thesis, this should be mentioned on the top sheet of the entry.

The Judges will pay more attention to evidence of original thought and ingenious application than to mere bulk. Moreover, as stated in paragraph 5, the report should be based on personal experience and work which has been actually tried out long enough to provide some evidence of its value.

33.9 Dates

Registration may be made at any time before 1 December 1972.

Reports will be received at any time after registration provided it is before 10 February 1973.

The awards will be announced by 31 May 1973.

33.10 These awards are being made in collaboration with THE NEW SCIENCE TEACHER magazine, London, as administrator of the Guinness Awards.

REGISTRATION FORM FOR THE GUINNESS AWARDS FOR SCIENCE AND MATHEMATICS TEACHERS OVERSEAS

Administered
a. locally by: Your local British Council office.

b. in London by: Science Education Section
The British Council
59 New Oxford Street
London
WC1A 1BP

in association with THE SCIENCE TEACHER, London, which is General Administrator, The Guinness Awards.

PLEASE READ THIS CAREFULLY BEFORE COMPLETING THE FORM

Entries cannot be considered unless a Registration Application duly completed has been received by the Administrator named above before work on the Topic is begun. As acknowledgment of receipt of the Registration Form, a top sheet will be sent to you giving your Registration number. This number will be the only means of identification of your entry; therefore, the top sheet must be submitted with your entry. (Note: where the registration is being sent to London, the information requested in the following paragraphs may be set out on a postal air-letter form.)

Name of entrant or person nominated to act for a syndicate (block letters, surname underlined please):
.....

.....Mr/Mrs/Miss 1.

Private address: .....

.....

School or College address: ..... 2.

.....

Qualifications, with dates (eg degree, teachers' certificate or diploma)

.....

.....

Brief record of teaching service and present position .....

.....

.....

IMPORTANT

1. If your address changes between completing this form and notification of the Awards, please advise Guinness Awards, c/o The British Council, 59 New Oxford Street, London WC1A 1BP as soon as possible.

2. In the case of a syndicate entry please list, on a separate paper, names, qualifications, teacher experience and present position of all members.

PART A - TOPIC *

Either: I/We have chosen to deal with the following topic taken from your suggestions (give title)

.....

.....

OR: I/We prefer to deal with the following topic of my/our own choice. A synopsis of the proposed line of approach is set out on the accompanying sheet of paper:

.....

.....

Signed.....Date.....

PART B - DISPOSAL OF ENTRY *

Either: If my/our entry receives an award, first publication rights are thereby assigned to THE SCIENCE TEACHER.

Signed (for syndicate) * .....

Date.....

OR: If entry does not receive an award:

Return entry to me/us * or THE SCIENCE TEACHER * may retain my/our entry with first publication rights.

Signed (for syndicate) * .....

Date.....

* Delete parts which are not applicable

BRITISH COUNCIL SCIENCE EDUCATION NEWSLETTER INDEX

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In the references given below the number before the point gives the appropriate issue of SEN, whilst that after the point gives the relevant paragraph.

Where a number of references are given, those referring to key articles are underlined.

An asterisk indicates that the article is concerned mainly with publications (eg of the project perhaps referred to). References to journals, monographs, reports, etc, will be found under PUBLICATIONS.

References to British Curriculum Development projects will be found under the following main references:

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References to Overseas Curriculum Development Projects will be found mainly under individual countries and major agencies, eg UNESCO.

There are also general references under CURRICULUM REFORM AND DEVELOPMENT, which covers both the UK and other countries.

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